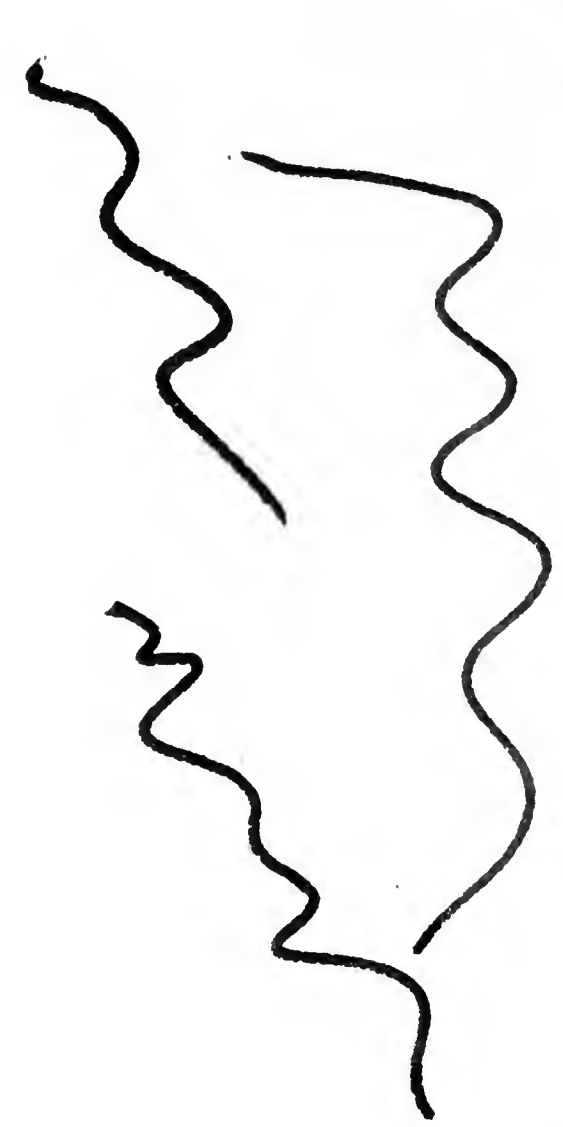


2700
100
1 in 7



.1425

1963



X

Index 1963

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A

0895



The aerial camera is now being used in mapping. From the information recorded on the photographs, planimetric map of 20 to 250 feet.

3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, and the high mountain are of the northwest, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 4 miles) or $\frac{1}{250,000}$ (1 inch = nearly 4 miles), with a contour interval of 10 to 100 feet.

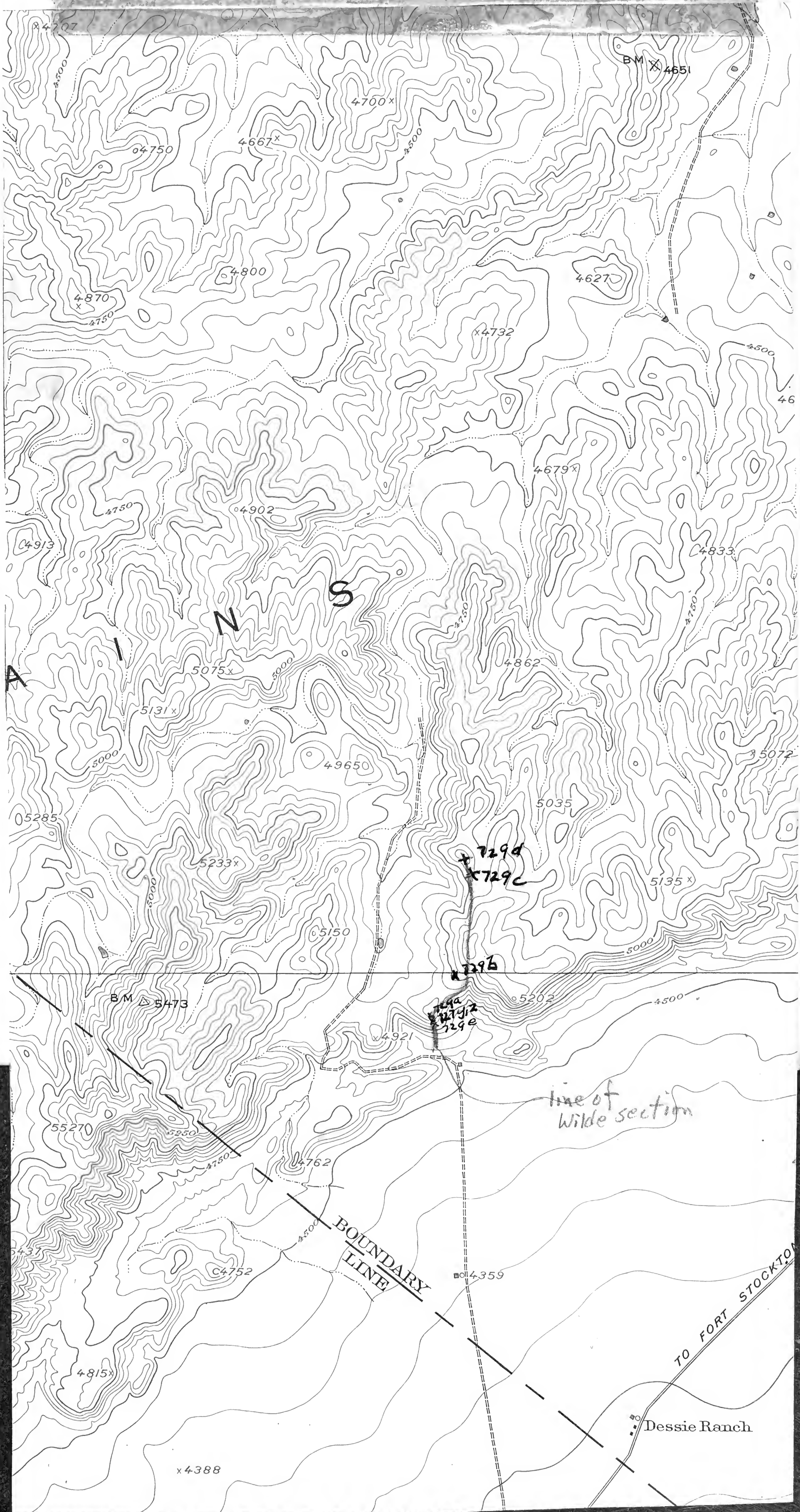
2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient detail to be used in the publication of maps on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile), with a contour interval of 10 to 100 feet.

of the particular area mapped.

with a contour interval of 1 to 100 feet, according to the relief

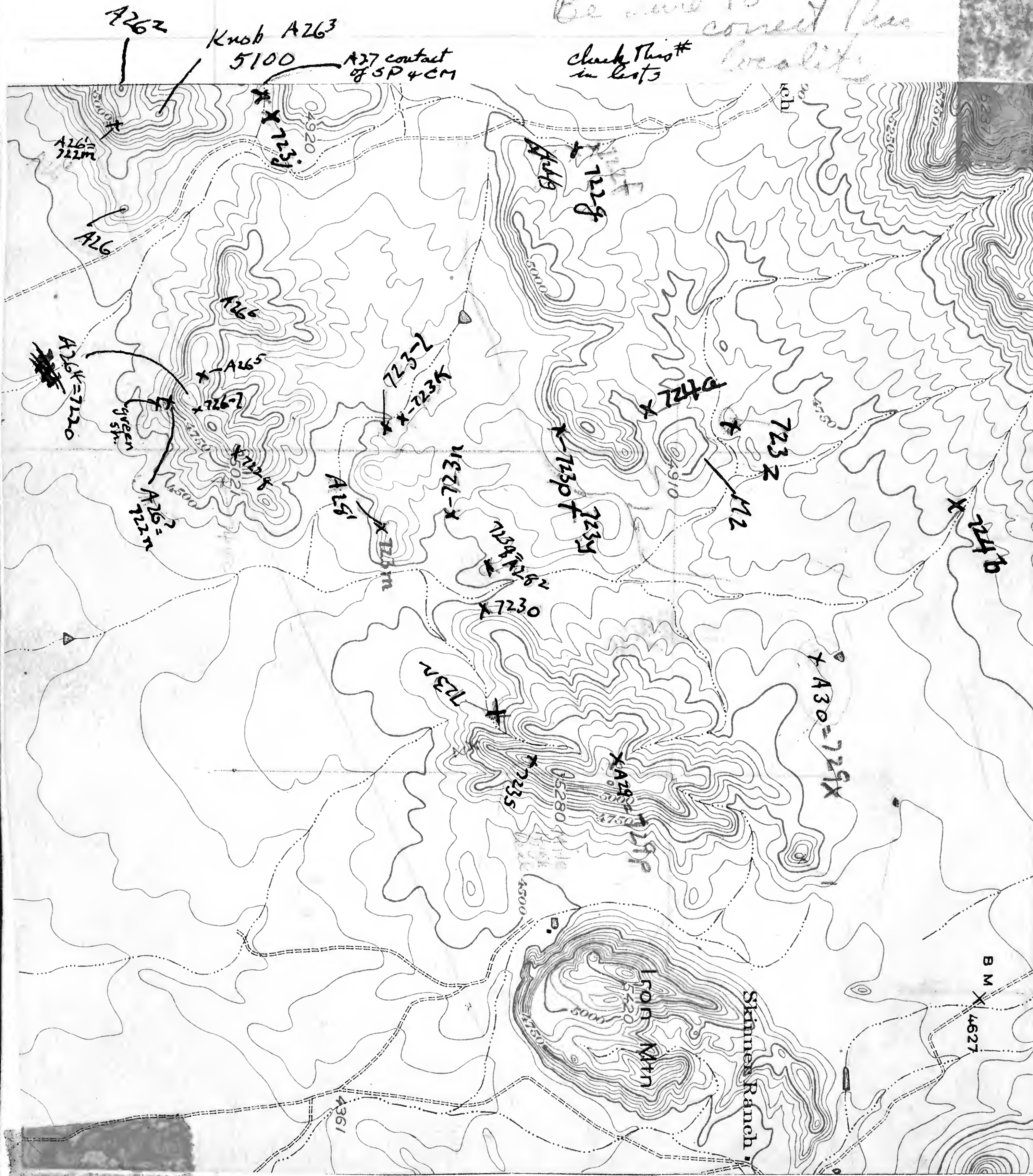
scale of $\frac{1}{31,680}$ (1 inch = one-half mile) or $\frac{1}{24,000}$ (1 inch = nearly 2 miles)

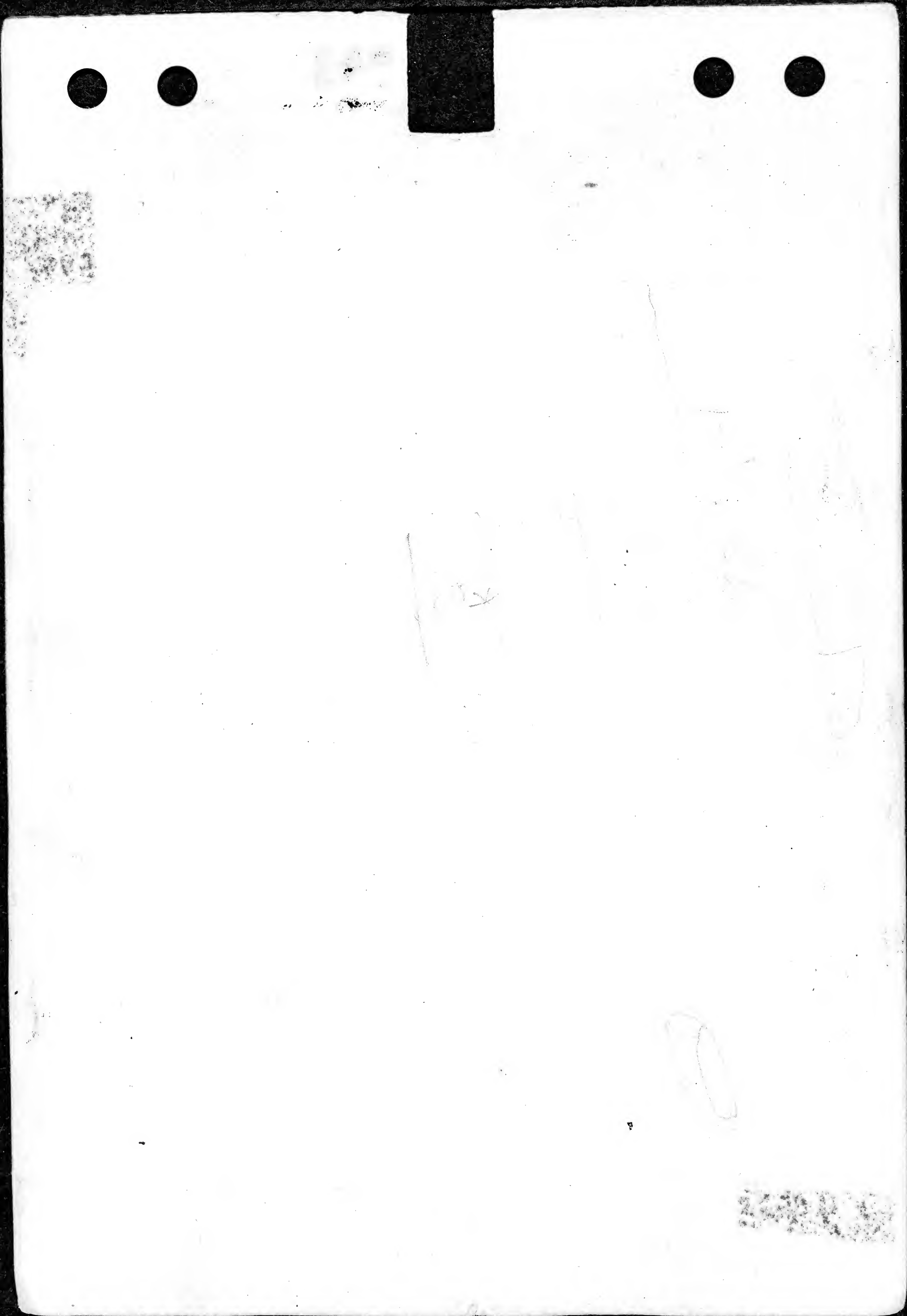
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Be sure to correct this locality
check this # in lists

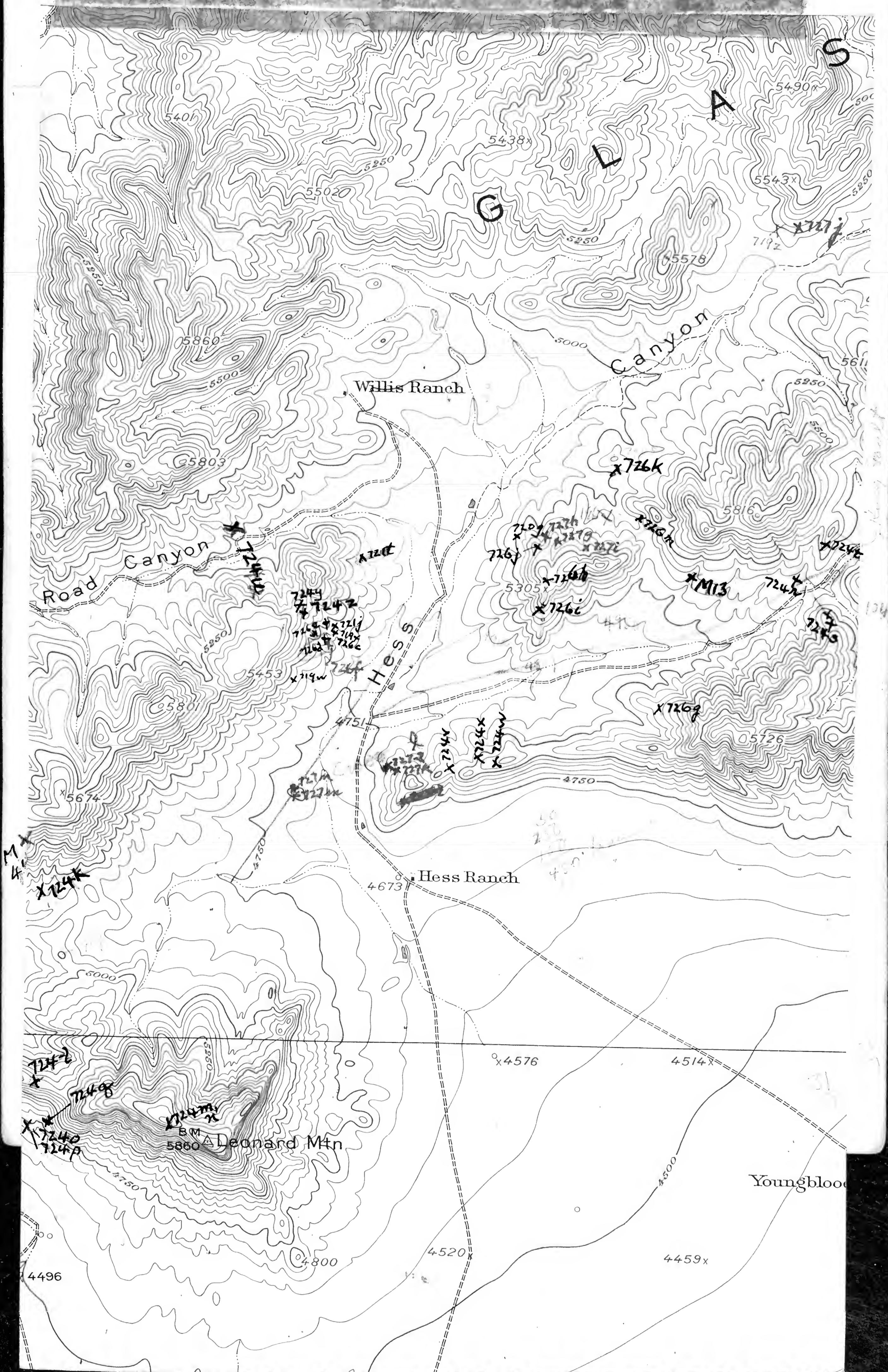




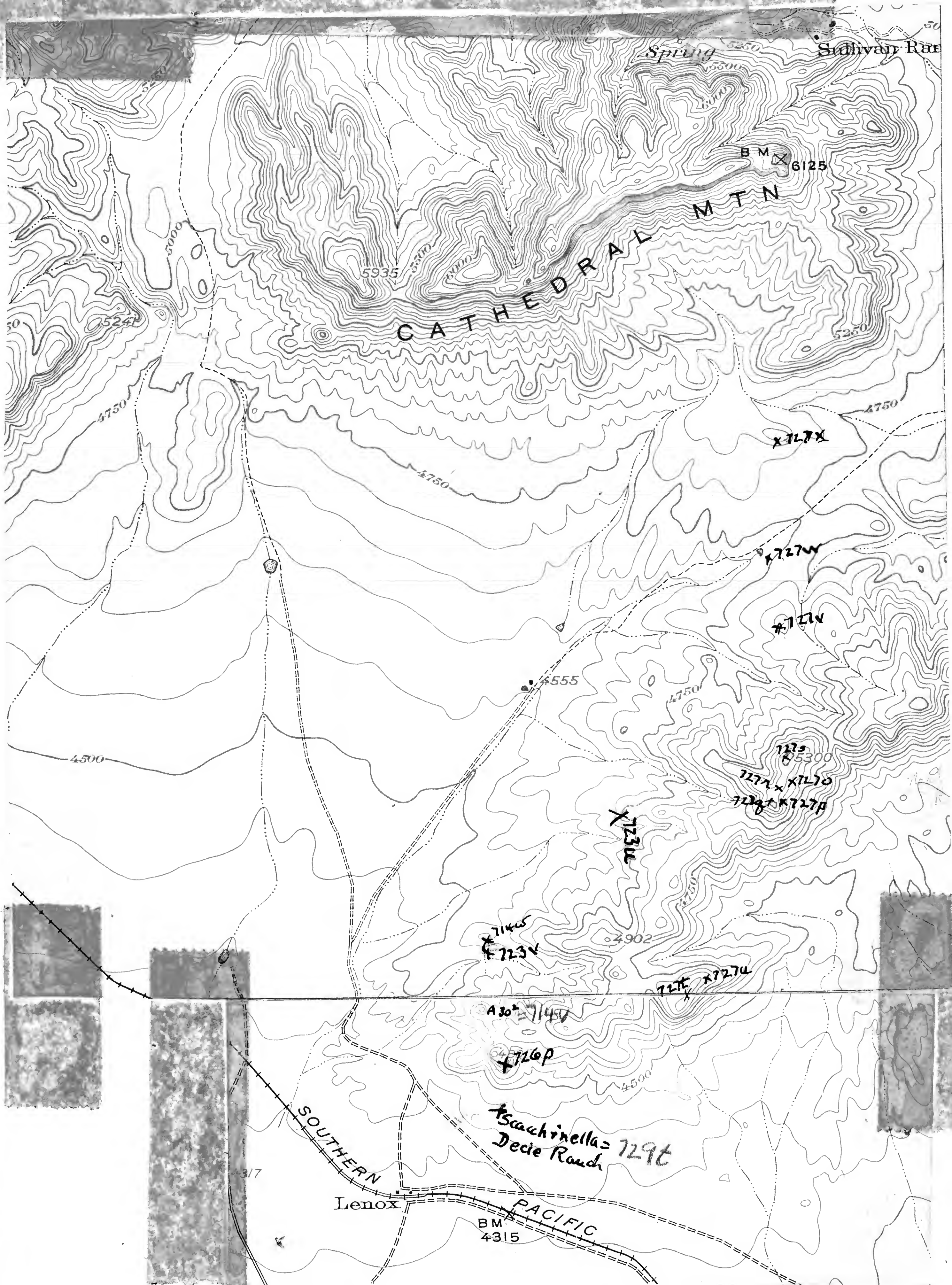
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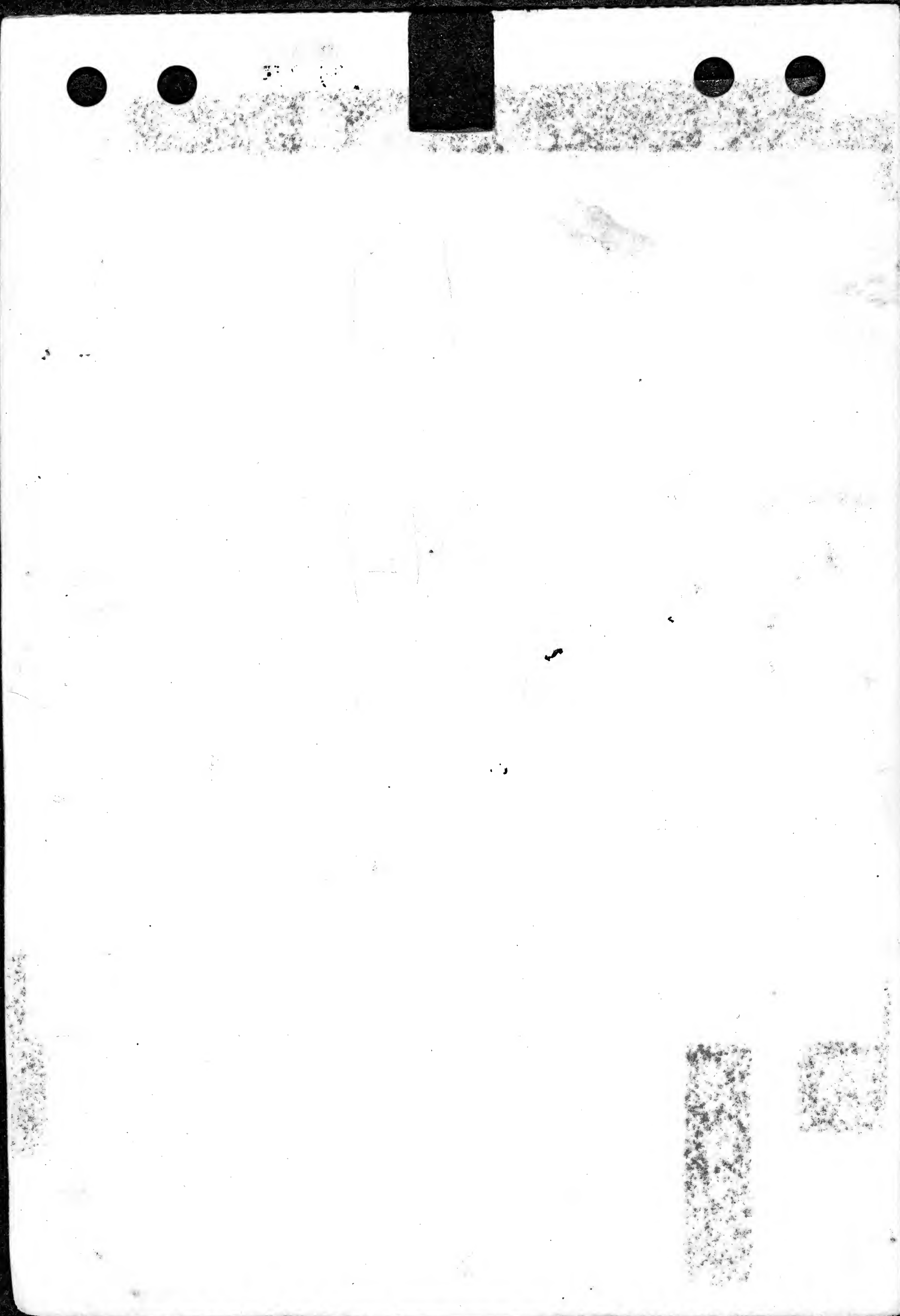
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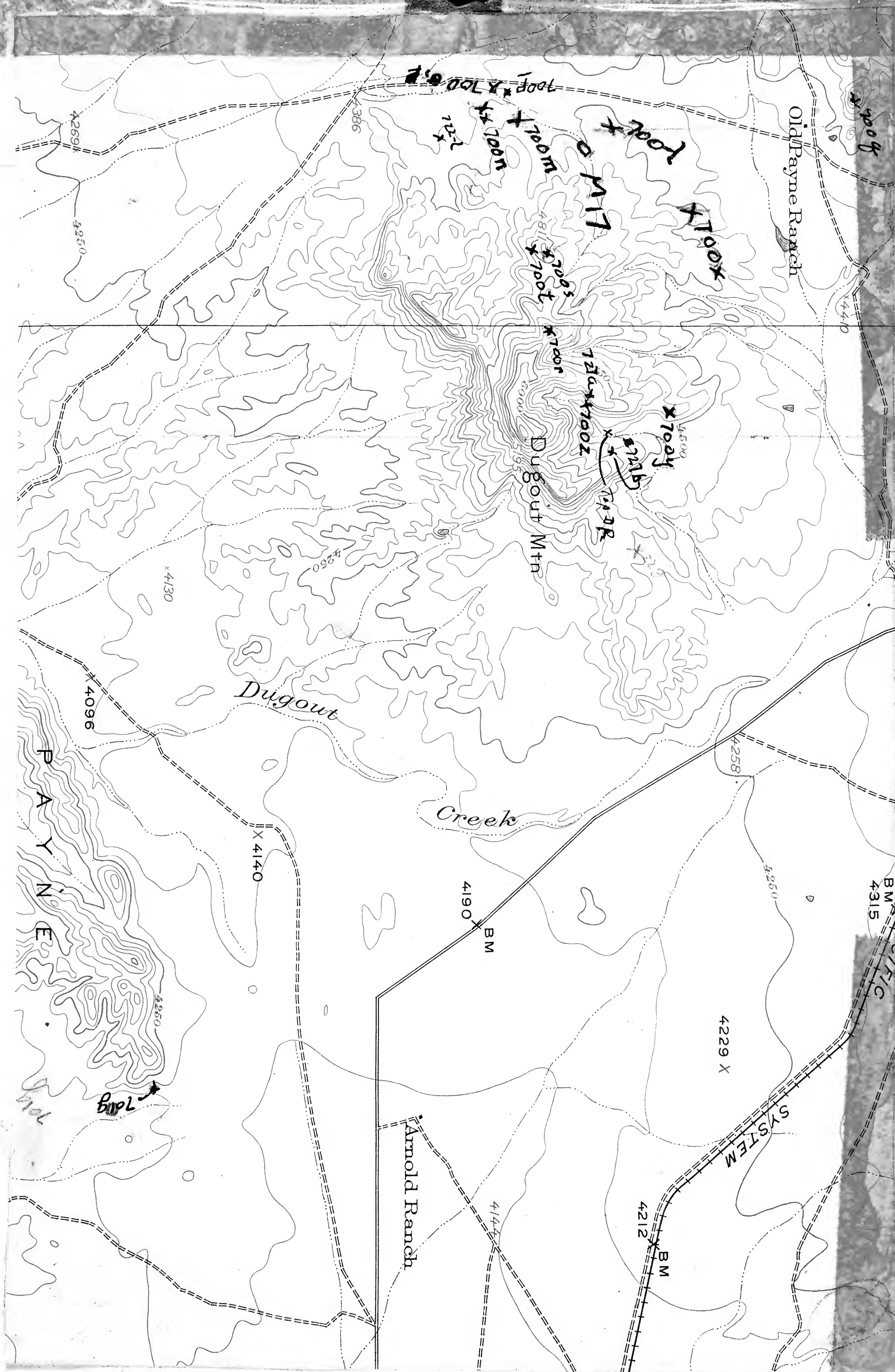


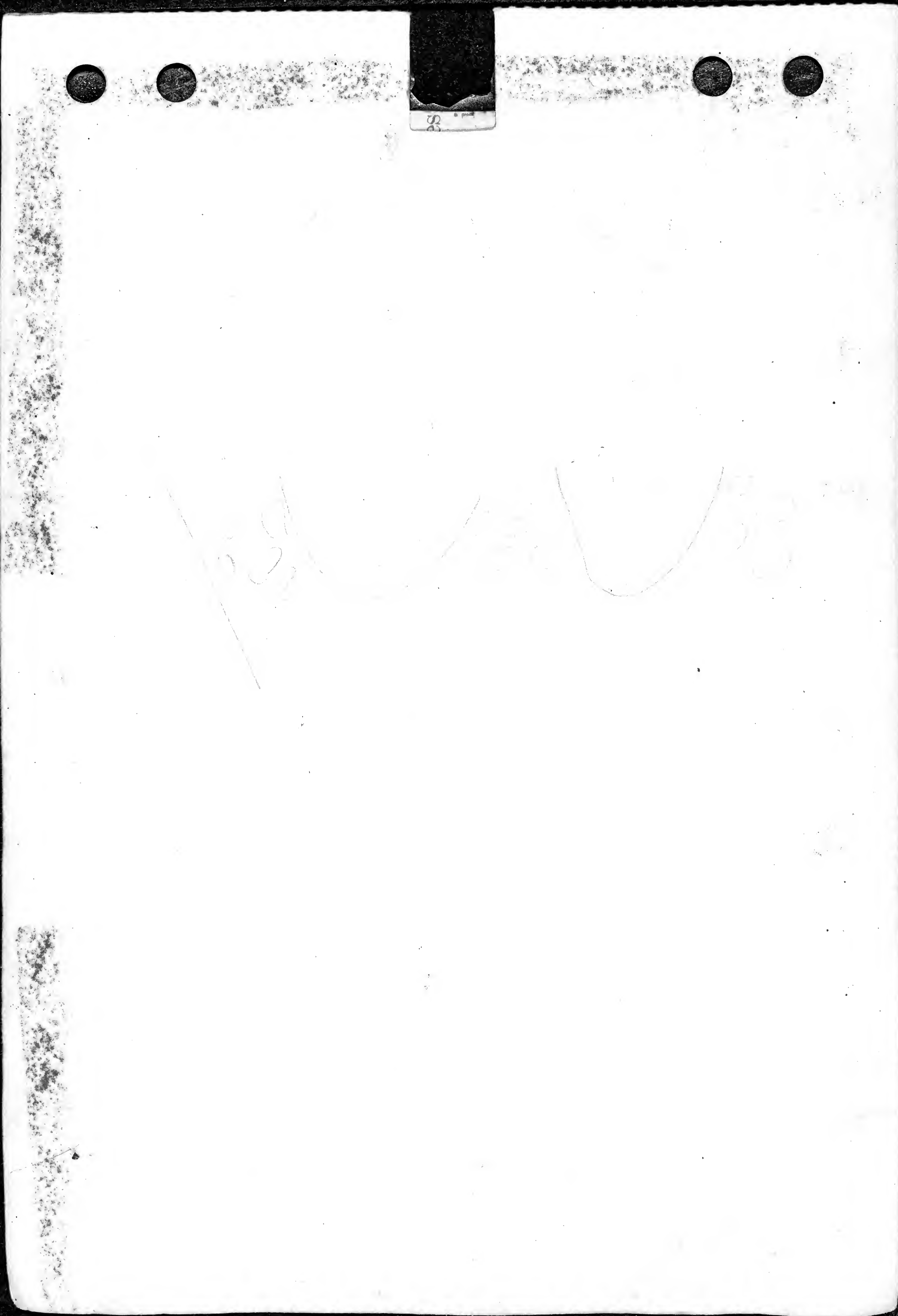


6899









902

~~1901~~

4750

4512

(51)

175

15

190

35

228

April 26

Spur at E and Lenox Hills

From top of Decie R. to base of
Bullivan Peak on end of spur is 228'. Top
of Decie Ranch thus at 4512' at base
of spur. Poplar Tank is 24 steps =
130' thick. Slope mostly covered.
The extreme nose is 38' under the
knob at 4750. The knob at end
is almost certainly faulted down about
38' from highest part of spur. The
Bullivan Peak is about 68' but this
is not the full thickness. Coscinophora
seen on west slope top knob.

On N slope of spur, about 200 yds
east of high hill, surface of S.P.
has large number of finger
like sponges patches of Cathedral
Mtn. appear on the N side of spur
near the main hill.

Roll 1 - 26 sponges in top of S.P.

27 patch of Cathedral Mtn. on spur

Tossels from
SP = A26'
722 m

A26'

Section from top of D.R. to top
of main hill at knob 5250 (unmarked)
34 hand level steps between top of D.R.
& base of S.P. Poplar Tank thus equals
184' of slope.

SP = Lowest 8 H.Z. steps are

Archa { 65' of bit^{uminous} lo.
87' shale } CM

SP = 108'

PT = 184'

4706'
DR

②

massive calcarenite with numerous *Spirindiotheca* in chert bands.
 At 8-9 comes a cal band of 2-3' and
 at base 6-8" of shaly material like
 the PT below. Top of 12. The massive
 calcarenite become mealy calcarenite
 rock with big crinoid stems, many
 sponges + algae.

Dip + strike top of SP N67°E 10°N
 SP = 20 Hk = 108 feet of slope

Hand levelling continues to first
 knob 5250'

Section above SP

A26²

16 Hk steps = 87 feet of slope
 all in yellow to pink silty shale
 characteristic of the Cathedral Mtn
 base.

A262^a

Hk steps

8 Hk in knob of bituminous limestone
 in blocks of 4-6" thickness and
 with goniatites
 8-9 is in shaly beds

9-12 to summit in bituminous ls.

Total Hk from top of DR to top of
 Knob is a total of 82 Hk steps =

444! This puts top of DR at
 4706'. The ls on top of the Knob
 is undoubtedly Hinge Leonard 3-4

Picture 28 = knob A26³ showing
 color change of CM above
 Sull. Peak member

5250
 444
 4706

A10
 34

100

CM = 28

SP = 20

PT = 34

82

③

A263 - Knob on North is 12 H.L. steps above the SP which puts the SP-CM contact at 4835. There are here 65' of Cathedral Mtn in top part of Knob.
 Contact of CM & SP at this point
 The latter is smooth surfaced calcareous
 latter is hard fine-grained ss of undetermined thickness (a foot or 2)

The southward face of A26 is mostly bihermal, bluish, smooth ls. with *Seyella*, *Heliospongia* (large about 3" diameter). This bihermal part faces the first gully W of the road. Rock contains many large conoid stems up to 2" in diameter

From upper part of SP (A26)
 collected bihermal material with same assemblage lithology etc as 908e.

④

Windmill hill

Shale chips & Drizzle to up to about 4650' on slope on SW side

Typical WC flint seen at about 4700' on slope just below western knob. Not in place but a lot of it. At this point there is considerable soft shale in the float. WC flint up to about 4725.

In ravine under westernmost saddle are 50' of conglomerate, with sparse pebbles and much sand and silt in lower part but becoming thickly crowded with pebbles in upper half. These pebbles are mostly small to 3 or 4 inches in diameter. Some pebbles of ls. but these are subordinate. Pebbles of ls. with frutes algae present but rare. Fossils seen are bryozoa, crinoid stems (small), bryozooids & echinoid spines. Saw no fusulines. The WC with fusulines mentioned above must be under this sand

The Deschmella beds to the saddle measure 44 feet thick. The saddle is at about 4800' and the base of the WC cgl is there at 4710'.

⑤

Keyserling

A26⁴ =

7220

Handwalking west knob of WM hill
from saddle0-5 to top of shale = 26' of slope
5-28 to very top of hill = 125 feet
of section. This makes the top
of the hill 4941' so that the
reading from the map 4950
is O.K.A26⁵ about 1/4 mile N down slope
from high knob, a thin patch
of Cathedral Mtn. in a swale in
the S.P.

4780

4780

A26⁶ From north saddle up section
in Cathedral Mtn. section
begin at 4780'. Dip & strike
N50E 12°N.

9HL

0-50' is all yellow-pink
sandy shale with little or no
limestone

2HL

50-62' - Platy ls, thin beds, bituminous

13HL

62-127' Massive light brown dolomite

21HL

127-139' sandy shale

2H.Lt3'

139'-154' to top of knob. which is
thus at 4924 but the plateau
top is given at 4900'The lower dolomite contains
scattered pebbles and some
poorly preserved fossils, bryozoa

907

This also has many goniatites.
This rock reminds of that on
Knot A26².

Fossils collected
722 m = A26⁷

A26⁷ - Wolfcamp. blocks concentrated
50 feet below the base of the
main ledge of the Skinner Ranch
(D.R.) Characteristic yellow brown
with many fusulines.

The windmill is at 4530 and
the top of the West float block
with many sponges at top is
98 feet above at 4648 = 4650
The WC blocks are 92' above top
of knob at 4742'. The base
of the Scaccumella beds is 50'
higher at 4792' = 4800'.

The day's work confirmed the views
regarding the constitution of the spur
and the nose of the hill just west
of it. The spur consists of DR at
bottom of hill at 4512'. Three
knobs are evident on spur, the
median or the highest, the two
eastmost have only a partial
section. The western one near
the main hill has a large
patch of Cathedral Mtn on it.

⑦

The section up the nose of the hill on east end Tenor Hills shows the SP with a vertical section of 108'. The SP seems to thicken east to end of hill where a big biohermal mass appears which has the same fossils as 708e. The easternmost knob of this hill with crest at 5250 contains 87' vertical of yellow shale and 65' vertical of bituminous limestone having goniatites. This is same I think as north end of Windmill Hill.

The shale of PT pinches out in windmill hill but it is possible that the lower *brachiolinella* beds do also.

Not possible to get any consistent dips on displaced blocks on W side Windmill hill. The beds are all very massive and seem to be a great jumble. The fact that a WC exp can be traced under displaced block indicates that the base of the west block is Deane Ranch member.

(8)
4760

April 27

Went to Alpine for box.

First to knob on east side

Windmill Hill. On close examination this appears to be another of the slipped blocks. The east slope of the hill has an aggregation of different types. The west slope or short side has some recognizable beds with Wolfcamp at base, followed by some beds with siliceous shales and containing *Spiridophora*. The upper part is calcarenite or bihermal beds, quite massive. It is all Skinner ranch but no normal sequence is recognizable.

Went up east knob Windmill hill at about 4750' came sandy cgl with scattered pebbles. The following section made by R.E. &

Vertical measure { 40' covered to base of Sk R.
13' tan olive sh.
13' chert pebble cgl. light colored matrix
17' cover f
5' not coarse
30' yellow sandy cgl.

base of Sk R at about 4868.

Top of Sk R on east knob mostly calcarenite, fine grained and with some cgl. *Strophostella*, *Entolites*. Small coll. at 722g.

722g

910

(9)

Hill 4920 - on N side spur

0-8Hh to top of SK R. All massive limestone, some cgl.

8-11 Cherty & shaly beds with thick bands of ls. At top of " comes a layer full of goniatites

11-13 - More ls & goniatites capped by a 3' band of ls.

13-15 - Covered shale slope.

15-18 - Shale & ls

18-20 - Massive cgl. calcarenite

20-28 - Shale slope of typical Leonard shale.

28-39 - Shale in thin beds between limestone layers.

39-52 heavy-bedded, sparsely fossiliferous ls. with goniatites. Some beds of fossil "hash". Upper surface with many goniatites

A27 Contact of SK R } and CM
is in road & stream 1000' (400 paces)
from Sullivan Ranch road.

723' large fusulines from
(40' vertical) below top of SP.

(10)

Data on 722g should be changed. As located here it is in wrong gully. It is second gully north of main ridge east of Sullivan Peak. Saw no blocks to collect here.

At 723g we saw *Epizoidiophora* and *Brachiopoda*. These beds are clearly the SP member but are only at base of hill. Their top 400 paces west of the road. My collections from farther up this road from 707 B (check) must belong in the Cathedral Mtn. formation.

707B must
be in Leonard
3-4

Send Weddings picture of Glass Mtn. fossils.

Did not recognize any separate layers of the limestone of the Cathedral Mtn. on hill 4920. The whole hill except the SE base is Cathedral Mtn. The lower part of the CM is not so shaly as in the knoke to the south and the basal part has much more limestone. We saw no *Institella* in this hill and I suspect we may have been too low for it. This does appear in the E-W valley to North

(11)

Miranda roll 1 - pictures 1-9 Windmill Hill, NE from WM Hill to Clay Slide goniatites on hill 4920.

Alpha Roll 2 1-4 Views from hill 4920.

April 28

Just at entrance from N to pass between hills we cross Leonard ls #1 of King which is not very thick and is mostly of bituminous limestone with goniatites but also contains some beds a foot thick made up of broken fossils.

723K one block

723-2 contact of CM & SKR sharp with yellow shale and massive ls. just below contact are smooth greenish ls with many fossils especially *Pyridiophora*. This is the very top of SKR. We took one large block and 2 small ones.

A28' = 723m Whole hill in SKR near top. Fossils scarce, gl. ledges occasional

Large collection
of rockout - 3 blocks

One
piece to
keep

(12)

A282 = just below crest of hill about 10' is contact of SKR and Cath. Mtn. Here the former has siliceous shales with *Glyptosteges*, but most of rock is calcarenite. Contact is at about 4575'.

7230

3 pieces
collected

7230 = King loc 9 - on edge of spur beside arroyo 15-20' of ls beds in shaly and cherty Cathedral Mtn. with bryozoans of mostly dark gray limestone. One doubtful *Chonetes* & *A. trigonalis*. This locality is definitely in the Cathedral Mtn.

Miranda Roll 1 - 10-21 hills between Windmill hill and hill W of Cron Mtn.

7230 - One block and some goniatites from SW base of hill West of Cron Mtn.

Spent day on hill between Windmill Hill & hill W of Cron Mtn. South part hill is in SKR, north part in C.M. The contact is well marked by CM shale on massive SKR limestone on the west side of the hill

None specimens
after structures

914

(13)

but on the east side the contact is of bituminous limestone against massive calcarenite. Visited King's localities 8, 9 and they are as he records. The beds at loc. 9 look like split Tomba stuff but fossils were not common. Saw Chonetes.

April 29

Hill W of Chron Mtn. =

WC - N 85° E 15° N = 723r

Wolfcamp

Large pebble cgl.

Shale
55'

The top of this shows some covered w/c congl float, sandy, scattered pebbles but it is mostly shale.

15' Shale

1' brown-stained sandy band. N 25 E 10° N

31'

Shale

shale 10'

6" sandy band

1' band of ls swelling to 1 1/2' small broken shale

10'

2" sandy band

1' shale

6" Dark brown breccia with fossils

723r

32'

bluish shale

6-7'

small pebble cgl.

915

(14)

Section up nose of Mile-high hill
Lowest ledge about 150' below base
of main ledge is a slipped block
of limestone cgl. The upper part with
large pebbles, the lower with fine
chert pebbles. W.C. sandstone, orange
pieces appear in float above the
cgl. ledge.

Handleveling begun at transition
of chert cgl & ls. cgl. There are 15'
vertical of chert cgl.

B

La cgl measures 65 feet vertical.
This interval has small ls cobbles
& chert pebbles, a great variety at base
but after about 10' the rock is fine
calcareous with large pebbles, some
a foot across. Saw no fossils.
This rock also contains angular
rusty masses, probably silicified
pebbles.

432'

25
145'
G

C.

55' mostly non congl. with
occasional pebbles. Mostly fine
calcareous. High spined *Orthis*
Linella. Huge crinoid stems
N 24° E 21°

F 82'

7235
5135'

E 22'

D 65' Same

C 55'

65' ls cgl

B

A 15' chert cgl

Mostly
D. same lithology as below
occasional chert pebble. Rock
fine-grained, dolomitic.

916

(15)

E - 5' cgl at base, scattered pebbles in fine calcarenite matrix, at top a yellow bed with limonite pectate. Enteleasma

F. Calcarenite. Thick bedded with layer of ls. cgl at top.

G. Partially colonate at bottom, upper 45' mostly bioclastic ls and coarse calcarenite full of fossils. Small corals, sponges.

Dip on face 12 W and strike N 60 E. Agree. The top of this knob to be 15-25' stratigraphically below the top of the knob at 5250' just to north.

Visited King's loc. 3. All in coarse calcarenite with scattered broken fossils. Elongate thin horn corals are common. The dip slope of hill 5250 containing circular depressions in which are beds of the C.M. in form of bit. limestone and cherty, yellow lumps.

Small collection

A29 is the correct location for the beds with *Uncinuloides* - *Torynchus*. I think this is the topmost bed of the Skinner Ranch. The *Torynchus* bed has a 2 to 4" silicious

(16)

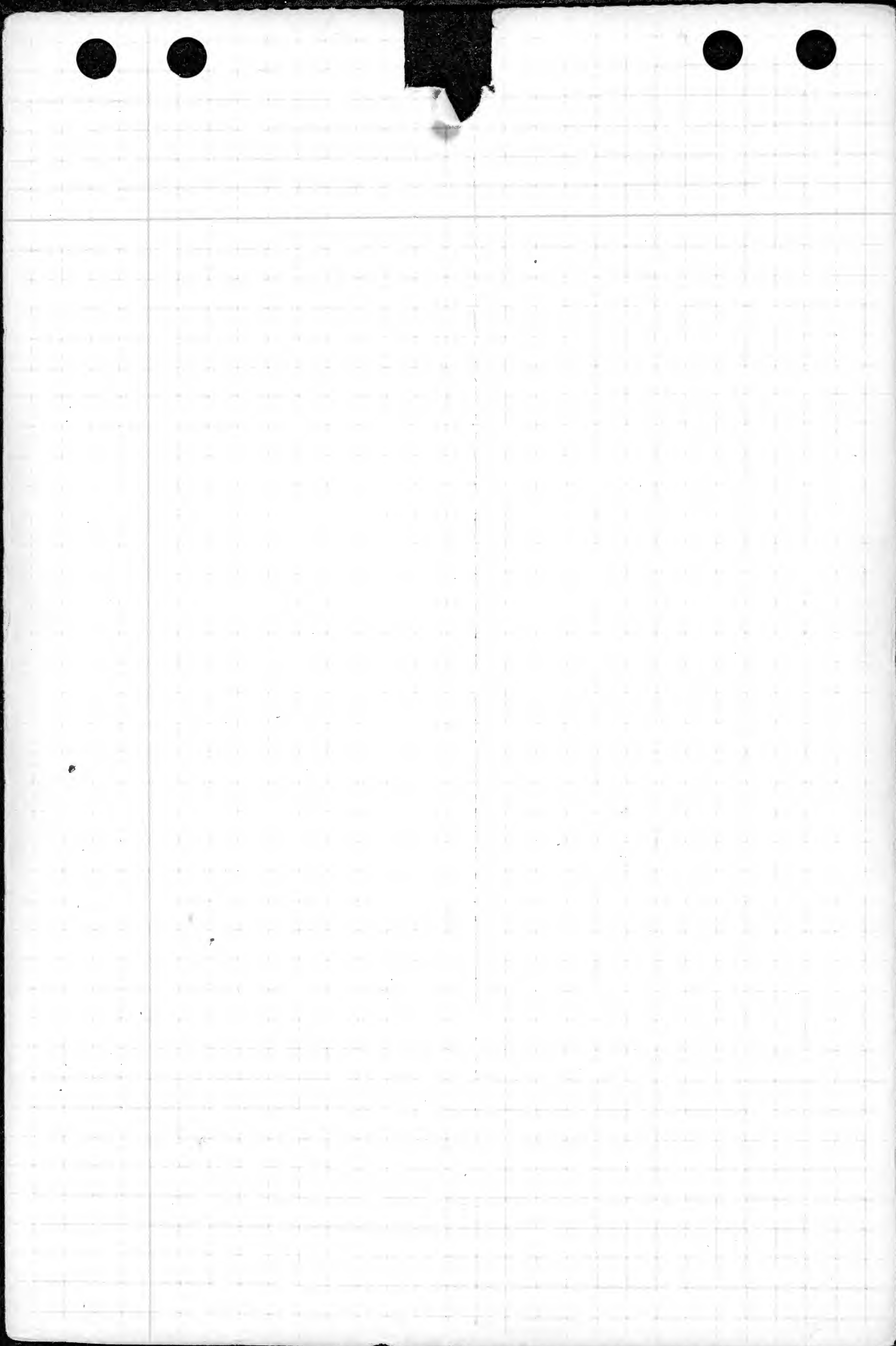
shin on it where it makes contact with the C.M.

Miranda roll 1-22-26 hill W. of Cron Mtn.

Alpa roll 2-4-18 hill W of Cron Mtn.

Saw Wolfcamp on SW side hill W. of Cron Mtn. (= Mile High Mtn.) Our section agrees in thickness with that of P. B. King. Then went up south nose of Mtn about in direction of strike. At base fine chert pebble cgl. gradually passes into limestone boulder agl. Took pebble with fusulines. The boulder cgl. extends for about 65' vertical - after which little cgl. was seen. The upper surface of the Sk R. must have been irregular, with many hollows (because patches of CM "shale" and chert appear in the slopes and down the hill.

The *Uncinuloides* is right at the top of the Sk. R.



727a
725a

918

(17)

April 30

729x

A30 = King 37 - Mostly steeply dipping bituminous sandy limestone with goniatites and crinoid stems. Sandstones have small bryozoans, small probably patch reefs made up of bryozoans and brachiopods. Photograph one with *A. trigonalis*, about $3\frac{1}{2} \times 4$ ', nearly square and about 1' thick. Also saw *Crustitella* at several localities.

723t about 25 feet below top of lower Word. Ledge 60-70' thick at about 5225 feet just below bench. This is N 45° W of small igneous cone near down W. M. R.

A30' Leonard ls #2

723w N 62° E 10° N. Dike measured 60' of Leonard #2. This is predominantly light gray weathering calcarenite but with many bryozoans. The latter is its most characteristic feature.

723t - The rock is generally a coarse calcarenite, gray weathering, often light colored on fracture. Looks very much like higher Word limestones. Fossils scattered in blocks where they occur, not closely packed.

(18)

A3p² - conical knob 4700' high. Top 50 feet is in heavy, massive limestone some biohermal. Contains *Orthis* and *Strophomena* etched out years ago & also many fusulines. The bed appears to be dolomitized. Cannot make out bed to which it belongs. Perhaps Leonard #2. Cup corals are common.

714w - Visited this old place on the highest hill but collected nothing. Just below this locality and south about 20' above the creek is another outcrop like that of 714w. This appears to be faulted down from 714w. Here in the faulted block along the creek we collected several blocks with *A. turgida*. We also saw a large bioherm with many *Strophomena*. Made picture

Musunda Roll 1 - 27

Alfa " 2 - 19-21

920

(19)

May 1

Spent day at searching The Road Canyon Formation on the west side of Billiland canyon. First locality is 723W and the hill above it.

King gives
80'

723W

M1 - Nearly a full section can be seen here, about 70-100' at a guess. Base has one large bioherm which was collected and is loc 723W. Above the bioherm are gray sandy limestones, fairly heavily bedded in layers of 6" to 2'. Some beds have siliceous skins. Forams are uncommon except for goniatites which are scattered usually but in a few beds are concentrated. Not far above the bioherm, round goniatites suggest *Wagenoceras* *ovus*. These are usually limonitized and silicified, are difficult to collect and show few characters. Good goniatites were taken from the bioherm which contained species suggesting 702C but with some exotic elements such as *Leiorhynchus*, *Eutelites* and the goniatites. This section and the collecting took all morning.

Miranda roll 1 - 28
Alpa " 2 - 24

(29)

May 1' — visited King's locality 14d which is north of 723W. Here the rock is the same thick-bedded sandy limestone but we saw no biohermal limestone. Fossils are rare throughout but near top occurred occasional *Richtiofenids* and goniatites. Saw several poor *Medlicottia* and occasional *Waagenoceras*?

Next visited 720d for more blocks. Only found one. Here about 30' above ~~top~~ of Word comes a thick lens of ls, perhaps 100 yds long, well exposed in gully and petering out in both directions. 720d is evidently related to this lens. Fusulines are common. Rest of fauna seems more related to beds below rather than to the Word above.

Sent to
Garner

(21)

May 2

Miranda Roll 1 - 34 = chert in
Word ls #1. - Others of Road Canyon on
N & W sides Ballblind Canyon.

35 face of thin bedded cherty Word #1

M2 - East face hill 4910 capped
by Word ls #1, thin bedded at
bottom but becoming heavy
bedded and massive at top.
Fossils uncommon and scattered
in lower part. Much chert in
middle region and some
sandy beds. Upper massive is
coarse calcarenite with
coroidal debris, common but
scattered, long tetracorals common
on top of 7232. Brachiopods are
uncommon.

7233 - West side low hill contains
numerous yellowish-gray mealy
bioherms which contain scattered
fossils. Bryozoans abundant. Ammonites
common. Bioherms seem cobbly
but usually grade into calcarenite
or shell breccia. These are like
those of 7119, near Clay Slide.
Chusateuthis present, but no
bioherms at base or at top.
The section is thus quite
unlike that on the East side
of the valley and at hill
4910.

923

(22)

May 2' = 724b - Sight on top of Leonard Mtn. N55°W of outcrop
Sight on small plug N81°W.
" " Hill 4910 is N120°E

Outcrop to road 0.7 mile

Mostly siliceous platy limestone with much chert, mostly thin bedded. Typical of upper part of Road Canyon. Contains bioherms on sand banks which contain an abundance of corals and other fossils in concentric sections. Brachiopods are not well distributed. This appears to be the upper part of The Road Canyon, similar to top layers on the Hill 4910.

Notes on May 3 - Examine Road Canyon on both sides Gilliland Canyon. Saw no bioherms on W side between 724b and 723w where one occurs at the base. Geniothites common but poor in upper part at 724f. Bioherms occur at base and top on east side. Thick bedded calcarenite 30-35' makes top of Road Canyon on E side but biohermal lenses & calcarenite lenses laterally replaced by shale occur in the 35' to 40' above the massive upper ledge of The Road Canyon

Gilliland
Canyon

Rd. Canyon 924
fur.

(23)

May 3 - Specimen marked 721Z
comes from very top ledge of
the main mass of the Road
Canyon but I think it may
be stratigraphically like 724C
The upper Bohemian masses
seem to swell and contract.

724C Lense 35' vertical above
main ledge, fairly isolated
mostly shell breccia. About 2-2 1/2
feet thick.

724f
173 - West side Gilliland Canyon
Road Canyon 70-80' Thick moderately
heavy-bedded limestone, fine grained,
usually dolomitic, weathering light
gray in beds of a few inches to
2-3'. Fossils rare and
scattered. Uppermost layer with
a skin of 1-2" of brown
siliceous material. Also goniatites
in uppermost bed. Very round
ones (Waagenoceras?) and
flat Medlicottia. Small collection 724f

Alpa roll 2 - end } Gilliland
" " 3 - 1-4 } Canyon E side
Miranda Roll 2 - 1-4 - Gilliland Canyon

925

(24)

Hill N 5° E of small igneous Knob. 724 & N of Leonard Mts.

Word shale

H	8'	Bluish gray granular, massive ls. - many fossils
G	27'	Blocky massive ls. finer grained than F
724e		brachiopods & fusulines abundant. Gray
F	32 1/2'	Great sand back or bioherm forms
E	5'	main pitting ledge. Many massive bygonia
D	27'	Blocky somewhat bituminous ls. beds 1' thick
C	21'	Mostly covered but lower half in ls beds about
B	16'	1/2' thick upper half yellow alabaster
A	18'	Massive blocky ls. 2'-3' beds with laminated
		siliceous layers
		Thick bedded with sandstone (beds 1/2'-1')
		massive bioherm 18' vertical
		corals, rich the fossils - many fossils
		like 702c.

Vertical Mts
Cath. Mts

This top of Road canyon is shown on this part of hill. Laterally S is represented by shale. Section located at about 5200' el. N 5° E of igneous Knob.

724e fusulines

724d " & one block

Miranda roll 2 -

Alpa roll 3 -

(25)

Billiland Canyon

May 4 = 724g.

Knob in valley. Upper 50' vertical of Knob is in Road Canyon limestone. Blocky moderately thick bedded, breaking in rectangular pieces, some with siliceous skins. Scattered fossils but unusually rare and widely distributed. Lower thick ledge with many ammonites of three or four kinds.

plus 70 to top of Knob

L	11'
K	6'
J	6'
I	10'
H	27'
G	15'
F	12'
E	14'
D	45'
C	11-20'
B	18'
A	0-44'

195

8

N of Leonard mtn.

M 4' Big bioherm at base of Road Canyon is conglomeratic at base, very massive, coarsely granular full of fossils.

N 25° E of small plug.

platy shale N 70° E 10° N

crasse massive calcarenite with cherty bryozoa many cup corals & other fossils

yellow platy shale

Blocky calcarenite ending in a 3' massive bed.

Bioherm of massive to with bryozoa fine-grained calcarenite zone cherty top

Coarse ool mealy at base, possibly with *Oryctolites*. Bottom very irregular

(26)

A. base about 5200 level on W knob Leonard Mtn.
 B - Top 2' in bedded chert under biohermal mounds.

C - On line of section the biohermal material measured only 11' but the section is on a saddle and the bioherm on the west goes to 15'. The one on the east to 20' also. Between is yellow shale perhaps flint but chert like not and platy calcarenite.

F very coarse calcarenite

G. Platy shale

H - light gray calcarenite, numerous fossils, mostly moderate. Thinly bedded but with several large bioherms. One is 10' high by 25' wide.

I - Thin bedded ls, chert and yellow shale.

J. Calcarenite with scattered but numerous fossils. Looks like our 720d. This corresponds with top of Leon Mtn about 5400. We are due north of the N knob of Leonard Mtn.

K cherty yellow shale - two thin ls.
 L - yellow shale capped by a foot of fine-grained ls.
 90 feet to top of knob in shale

Fossils
 taken 724h

(27)

Base of section. This begins at 5311' and extends to bed I which is top of Road Canyon or to top of bed F which is last massive calcarenite.

Coscinophora from bed 14

The bioherm appears to me to be a veneer over the massive conglomerate. The veneer measuring 10 to 20' in thickness.

~~Specimens marked 744a from Clay slide must be relabeled~~

724j - Two blocks from a huge loose piece detached from main lower bioherm.

724k Bioherm of Cathedral Mtn with large Perinites.

Miranda roll 2 - 5-10

Alpa roll 3 - 5-8

The Road Canyon has bioherms at different levels that swell and thin. The largest is the one at 724j.

929

(28)

May 5
Leonard Mtn. N end
Line of section N5°W

D'	41'	all in unbedded massive calcarenite forming the capping ledge of the crest
C'	16'	mostly arenaceous, shale & thin bedded calcarenite 6"
B'	22'	Massive bedded calcarenite siliceous shale. 1' shale 3' below top. mass
A'	1'	shale
Z	24'	flat bedded sandy ls, sand in patches, not p
Y	11'	Siliceous shale, thin limestone - partially covered
X	1'	calcarenite, flat, 1" siliceous skin
W	18'	mostly covered but much shale & yellow clay. in float
V	12'	Massive ls cgl. Pencilanites
U	6'	bedded calcarenite massive
T	12'	Massive cgl - Sponges, Elliottella, cup corals
S	16'	Bedded (thick) calcarenite - base of cliff
R	5'	clay pink & brown
Q	22'	Greenish fine grained biohermal ls.
P	16'	Covered
O	14'	coarse massive calcarenite with large crinoid stems
N	16'	covered
M	44'	mostly black calcarenite, dark 6"-1' siliceous skin
L	11'	crumbly dark gray blocky ls. with Elliottella (sp.)
K	32'	thick bedded, light yellow gray calcarenite
J	5'	massive gray green biohermal ls. with enormous crinoid stems
I	14'	Massive calcarenite, siliceous tops bed 31 thick
H	2'	Neosponges, Elliottella
G	25'	Covered
F	22'	Massive calcarenite not showing bedding
E	49'	Some biohermal ls. N45°E 8°N
D	11'	Covered
C	5'	Bioherms with many fossils, smooth greenish ls. over
B	11'	flat bedded, coarse calcarenite
A	22'	biohermal ls.
	10	Solid massive fine grained, pellet limestone
	504'	with forams and some sand

(29)

D- Smooth greenish bihermal ls. with many fossils. *Scacchiella*, *Heliopora* (large) N58E6°N.

F Very massive - have some lime cobbles.

H- Dark gray calcarenite with siliceous streaks, *Scacchiella*, *Neosperifer*, *Meckella*, *Elliottella*

Q Contains large *Entelates*, *Heterodonta*, *Pericardium*, large *Wellbella* and possible *Scacchiella*

R chert light brown - 5' - sandy limestone in basal foot
Meckella

T, V. pebbles small 3-6", ragged

Miranda roll 2 - 11, 12 SKR chert
" " 2 - 13, 14 " sandy ls.

Z and on surfaces. 1' below top is a layer of shale of unknown thickness

B1 - *Entelates*, *Heterodonta*, *Trochus*, *Pericardium*, *Leptodus*, *Trochus* at very top

D' Forster 15' with corals, occasional small pebbles. Top 25' with few fossils

The *Scacchiella* biherms are characterized by orange-brown rusty spots and streaks, fossils replaced by it.

931

(30)

Coarse ribbed *Megascia* in top bed. It is possible that the upper 4' really belongs in the Cathedral Mountain if one correlated on *Torynechus* zone. However *Torynechus* occurs in top at loc. 709.

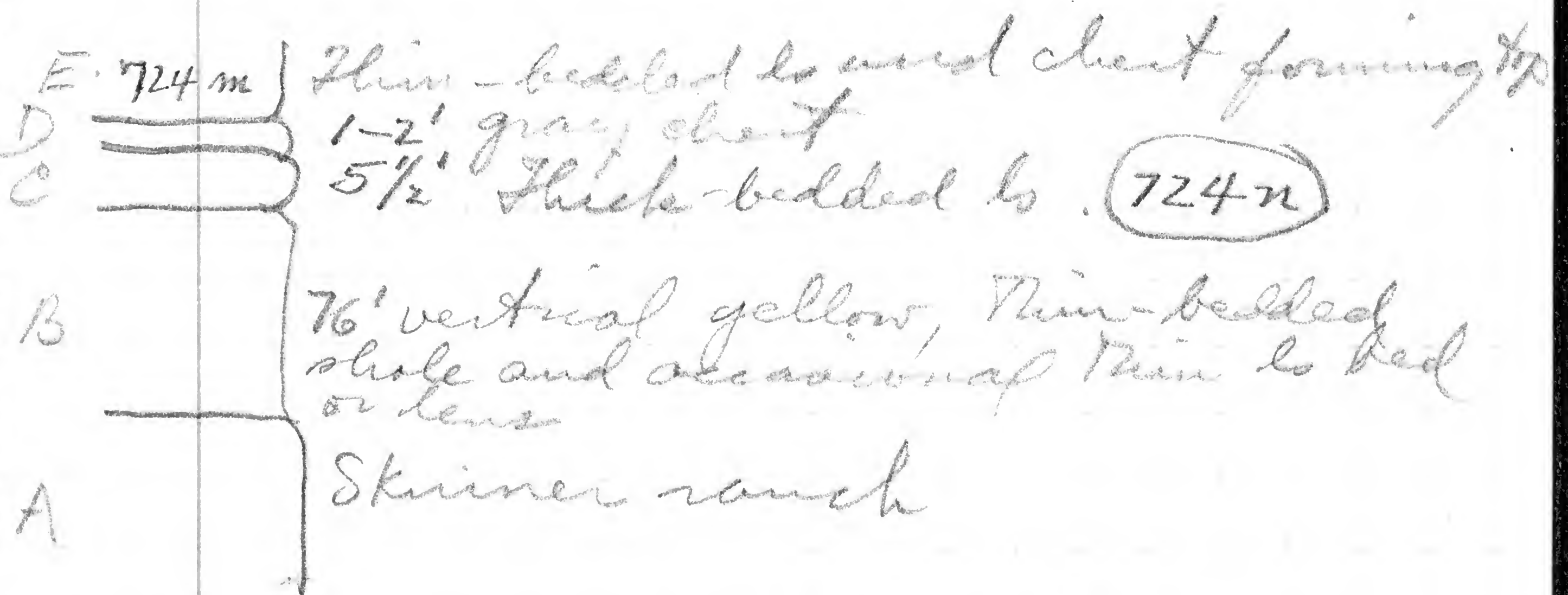
724-7 Saddle, $\left. \begin{array}{l} N53^{\circ}E 12 N \\ N65^{\circ}E 9 N \end{array} \right\}$
Best surfaces in saddle show best the fauna

Torynechus extends stratigraphically 40 or 50'

724 m-north knob (high) of Leonard Mtn.

On south nose the following vertical section occurs.

Inarticulate common in C but abundant in D+E



E abounds in *Inarticulate*. C may have *Torynechus* (or *Rhynchopora*)

Near the Mountain
north of Leonard
Mtn. King 132.
NNE of BM 4627

On top of hill in
Gilliland Canyon
between BM 4673 + 4869.

0.8 mile Southwest of
Word Ranch house
King 257 on nose
of hill

Mark on maps.

Waagenocera in Word #1

(31)

Bisheems appear on northeast side of this knob. On the north nose of this knob the bisheemal ledge is some 10' of massive ls. The rock is much different from the Skinner Ranch because it contains scattered quartz and chert pebbles, all well rounded and small, less than an inch.

724m - Thin *Strophia* beds E

724m - 5' bed near top of Mtn C

724o - *Fusulina* from bed A of main Skinner Ranch section

724p - *Saccinella* bed (D) of main section (see page 28.)

Waggoner

Cgl. on 4700' contour on east side ravine

SKR

22'

covered

11'

chert + ls pebbles

30'

covered = shale?

ls cgl. in ss + pebbles

Miranda roll 2-

11-18 Leonard Mtn,
Skinner Ranch &
snake

Saccinella abundant between 2nd & 3rd bisheems and on top of second one.
Heliospongia on top of 2nd one

(32)

Don Mth Ranch 10 miles by road from
Marathon
Marathon to Hess Ranch House
is 14 miles.

Igneous body

Road to outcrop is 50' horizontal
and from beginning of outcrop to
igneous body is 325' horizontal.
The igneous body is estimated at
200 paces = 500 feet horizontal.

Outcrop consists of massive
limestone with small well-rounded
pebbles and some biohermal material
with Entolites. Pebbles extend 150'
from south end outcrop for
feet toward the igneous body.
Beyond the last pebbles to the
north the rock is bluish,
biohermal and loses all of
its inner structural character
but maintains the distinction
between biohermal material &
non-biohermal.

7242

7245

7245

Contact of Hess with chertella
beds, here massive with
scattered pebbles. Same beds go
into stream down N. face of
hill and across road.

(33)

They also are in the hill making a prominent cone = 724 t.

Conical hill for 50' ± is all dolomite dipping south steeply Dick thinks it is Hess under the basal Cathedral Mtn. The block on the conical hill is thus punched up and faces southeast we found *Orthis* on the west face of this hill. I am unable to see any rock in this hill except the lower Cathedral Mtn. The rock is very steeply tilted about 40 to 50°. Opposite the crest of hill, normally dipping WC beds against it. This is about where the igneous body ends. We saw no pebbles in the C17 here but in unaltered rock *Orthis* is common. Saw fusuline shadows in bluish limestone in steeply tilted part of ls.

Strike N 85° E 50°.

Thin, dark coarse calcarenites suggest lime sand between Fishcamp & little yellow shale also suggests CM.

Miranda Roll 2 - 19 - to end

Hess Ranch area

Miranda Roll 3 - 1 - 9 over around the igneous body at the Horst

(34)

May 7

724U = King 243

Lower part Word ls, mostly
buff sandy ls in ledges 1-2'
Thick. Some brown pebbly
chert bands. I guess at least 100'
of ls.

724V - fine pebble cgl. with
fossils

forms crests of two easternmost knobs
appears on west side knob at 177.
Could this be the same light
bas above the Scacchiella
beds on NE Leonard Mtn & above
Scacchiella north of Hess House
Hills. West of the 177 mark we
have dark buff dolomite, massive
bryhermal?

177
Hill NE
of Hess
Ranch

Hill
5801

May 7' - Center knob above
Road canyon ledge - Handlevelling
above top bryhermal mass of
Road Canyon -

726C - Ammonites at 719x

4972

278

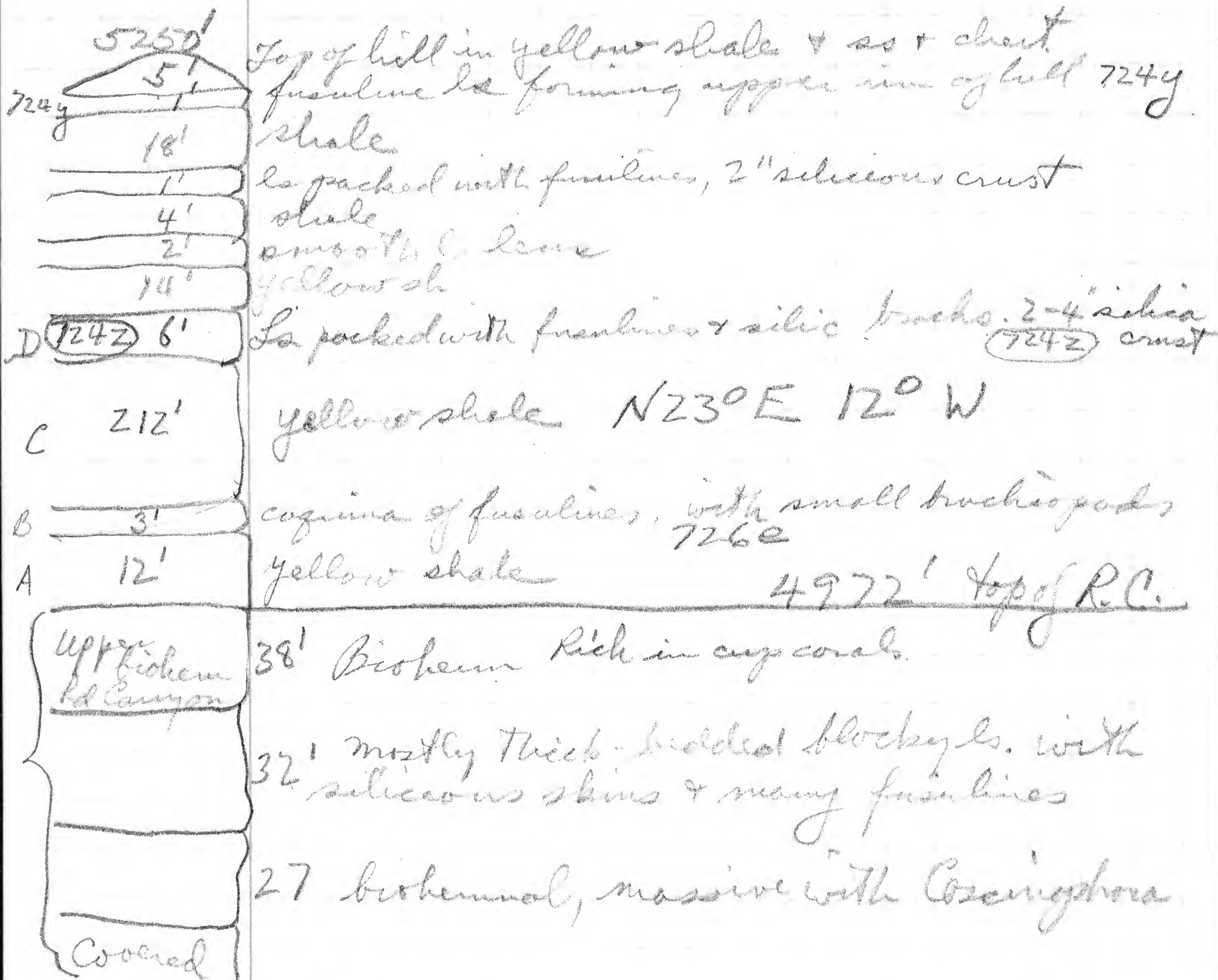
5250

37
1195
112

936

35

724 y²
726^e



Road Canyon proper measured
on 721 y locality. Probably does
not include the lowest bioherms

44 22

(Pl)

Ammonite bed = 726c is 70' underneath the top ledge (upper bioherm) of the Road Canyon.

726d

The small Leptodus bed is about 25' below the same point. Ammonite bed is at 4900'. Ammonite bed is in form of calcarenite masses, poorly bedded and containing a bioherm.

Upper bioherm just below 5250 butte is about 20' thick.

726e is fusulines from bed B in section on p. 35.

Miranda roll 3 - 10-14 du Road Canyon and Road Canyon fm.

5250

938

(37)

One specimen 724x turned over to Garner Wilde.

May 2

Section up hill with 721j.
Section May 7

27'	Large bryozoa with elongate encrusting shale + thin-bedded ls. level of 721j
11'	
16'	Block ls., some shale, ls. with calcification
6'	Shale + thin ls., shale yellow
30'	Bryozoa with <i>Carrinophora</i>
16'	Bryozoa + massive calcareous ls. like 702c
106'	

Dip + strike between top bryozoa and ledge 726c. $N53^{\circ}E 14^{\circ}NW$

728g

Visited 708.4 walked to top of hill. On side nearest main mountain mass. The rocks are tipped steeply toward the northwest showing evidence of considerable disturbance and definite presence of a fault.

Miranda roll 3-15, 16 fault + King 104
Alpa " 3-14, 15 fault, east end near Remah Horst

5370

939

(38)

Section over hill 5305
Line of section N 5° E.

May 9

I	35'	Bihermal beds with <i>Saccinella</i> & fusulines at base
H	15'-26'	Shaly beds with thin ls having large <i>Ampholotodus</i>
G	60'	mostly calcarenite, dolomite biherms
F	8'	Massive bihermal (like ls, dolomitized)
	27'	Heavy bedded dolomite with curved stems base SK R.
E	27'	Massive limestone, smooth to granular numerous fusulines WC
D	81'	Generally cobbly to mealy limestone with many curved stems. <i>Pentactites</i> at 50' in upper part
C	11'	Mealy zone, curved stems
B	238'	all ls congl., tightly cemented pebbles up to 6", few siliceous ones. Pebbles with <i>Fucus</i> algae
A	54	Limestone cgl. basal 25' with chert a quantity pebbles as well as rounded ls cobbles 2-3". <i>Siliceras</i> absent or rare in upper 29'

446' to knob at 5305 Section began at 4859'

446' to crest at 5305. *Saccinella* found 25' below top or at 5280'. I think contact with SK R is 35' below top at base of 27' dolomite + 8' bihermal dolomite.

561-9
081
11
- 12

- 11-9
081
0825

5305
35

(39)

Scacchinella bed fossils occur about 250' down slope of crest or 25' below the top of the hill at 5280' on north facing tongue.

The top of the knob at 5205 is, I think, Albion in the base of the Sk R. but its top is dolomite and the sides are patchy dolomite and dolomitized limestone. In this case the contact between WC & Sk R would be at about 35' below top of hill or at 5270' on mountain front 25' below (west of the knob) at 5280' is a saddle formed in shaly material at the base of another knob, bioherm or series of bioherms here we took fusulines, Scacchinella and other species from low in the Sk R.

Handlevelling down from 5280' to 5230' all in dolomite faithfully preserving character of rock: massive bioherm or flat bedding
5280-5270 - covered

H - shale with Omphalotrochus forms a saddle at point H This makes a prominent break in the contour of the hills From the map this elevation

31
5
155
13
168

2515
 4850
 300
 12
 20
 5
 54
 31
 85

5327
 4850
 477
 57
 440

941

(40)

appears at about 5175! We
come out at 5112' about 60' off.
This is in a swale between
bioherms

Strike + dip on H = $N57^{\circ}E\ 24^{\circ}NW$

726j- bioherm on top of bed H
The shaly beds with *Ampholotrochus*
There are found abundant *Furcula*,
Scacchinella and other typical
fossils.

Bed I - Measured at 35' is one
bioherm (I think) much of the
surface dolomite.

The saddle at H is 51 H L steps
above stream at 4850' and puts
saddle about 5150 - by map
location it is at 5175'

I Darner dates *Furcula* as
Leonard #1. The *Crustictoria*
occurs on the long nose that extends
east of the saddle at H. This
bioherm is clearly underneath
our location I. It must be
in the lower part of the SK.R.
and thus above *Scacchinella*
of the Davies Ranch. They are
definitely above the *Crustictoria*
zone.

942

(41)

726K *S. crassitectoria* in
flat 4-6" bed near Seacrest

Miranda Roll 3 - 17 - 30
Hess Ranch Hwy 5305 + 720e
Alpa Roll 3 - 15 - 17 same

943

(42)

May 10

Bioherm in Sullivan Peak
member Hill 4801

Horizontal 44 paces = 110 feet

Vertical 7 H L = 38'

Base up to 5' is congl.
Ls cobbles some 1' across
with siliceous margins. Mid
part with many siliceous
bryozoa on W side a tongue
about halfway up extends
into bounding cgl. This
tongue has small richly layered
(and new genus of *Teguliferina*)
and numerous sponges.

Matrix mainly smooth fine
grained limestone with small
algae. Large crinoid stems &
coarse calcarenite in 5-10' up.

The tongue on the west side
overlaps the top of the cgl. and
is a sponge-brachiopod mass.
The brachia must have favored
the outer parts of the bioherm
Exochia was in the
sponge reef on west side and
near top.

The top of the bioherm is
capped by a foot or two of
shale and then by thin layers
of the Skinner Ranch.

944

#3

Top of bioherm has a skin of silica
A small fault cuts along the
east side of the bioherm, a
displacement of about 20'.

Windmill hill

Beds with forams (WC) about 20'
at a guess below cgl. in gully
Spirodiophora found in shale
on margin of westernmost
saddle.

Alpa roll 3-17 - end Sand Lenox Hills
Miranda roll 3-31 to end Sand " "

Alpa roll 4-0-7. Lenox Hills + Windmill Hill
Miranda Roll 4-0-5 " " " "

945

(44)

May 11.

Leonard Mtn. - Very top at 5760 is in Shinner Ranch. First Leonard is on the larger knob to the north - say 724 m, n. A fair thickness exists down the dip.

Went to Horst for lunch, walked with crowd through notch to our 7200 locality. In this direction the distorted bedding of the upper Lower Hill can be seen and on it a veneer of flatter bedded limestone running up the slope. This extends into a small ravine and *Scaphinella* is present here. Then comes a small knob and another gully to arrive at 7200. This knob is also a *Scaphinella* knob. The WC-DK contact must be at about 5075'. Found ammonoids at 726 m.

Miranda roll 4-6-15 Leonard Mtn, Hess Ranch Horst.

946

(45)

May 12

726m - On slope near road just beyond stream crossing in Hess formation King's loc. 223 with *Wellerella* and *Composita*.

Section at
7260

7260 - Fine bioherm, light blue to green gray abounding in *richt-*
hofenids.



Dolomite with many holes of fusulines

Thin-bedded bituminous ls that weathers white interbedded with flat siliceous shale

Bioherm of *richthofenia*.

Cherty beds to base of hill =
Cat. 726m.

King localities 235 and 249 are on this hill. King calls his locality 235 Upper Leonard. It looks to me to be the same as my 703a. Puzzling elements at this place are the productids of the genus *Rugatia* which usually are lower in the section.

4409
242
1587

265
224
63
105

212
415

769
1087

947

Hill 4801 - Southwest
Lenox Hills

(46)

See notes
of 1964
p. 989

105' vert
Cath Mtn

Section started on top of Decie
Ranch member, N 15° E 90

Section made by direct measure

N 40° E 17° N

Bituminous ls in beds of 6-8" thick
crumbly shale 2 to 5'

N 38'

M 22-25'

L 23'

Coarse boulder cgl. = King's ls #1
Bioherm on east side is 38' thick
Bioherms = 726 p.

K 76'

mostly yellowish to yellow-gray sh
with sporadic thin ls & sandy-cgl. ls.
with siliceous sponges. *Spiridiotrypa* is common

J 1-3'

Lens, ls cgl. small quartz pebbles, ls pebble 4"

I 14'

crumbly yellow gray shale

H 1'

Hard smooth yellow gray ls.

G 30'

Crumbly gray brown shale

F 2'-3'

Hard yellow sandy ls. bed, small pebbles
Spiridiotrypa

90'

E N 55° E
12° NW

Thin yellowish shale with interbedded thin ls.
cgl. and coarsely detrital. Beds of dark
conoidal ls. - Siliceous caps on thin ls.
Much shale in top half

D 2'

2' cobbly ls passing into calcareous ls. *Spiridiotrypa*
much covered but thin-bedded detrital ls.

C 74'

sandy-cgl. ls. of thin ls. with siliceous caps. beds up
to 6" or 8" some thin-bedded shale

B 2'

ls. cgl. 2'

A 20'

mostly covered but float in thin-bedded
sandy ls & shale.

315'

(47)

Bed H Besides the darkls this interval has small bioherms with large crinoid stems.

These beds are draped over the large bioherms but appear to belong to the Leonard #1. The Cathedral Mtn contact is abrupt & sharp. Top of this bed is at
The *Scaphimella* (Daine Ranch) bed is at 4409'

Miranda Roll 4, 16-26 - Loc 7260
and cgl. & other views at hill 4801

Alpha Roll 4, 8-18 - Loc 7260
and cgl. & other views at hill 4801

At south end Lenox hills in hill 4801 The two big bioherms are at about 4658' but the section goes 38' higher to include the dark limestones above them. Followed to the west several other bioherms can be seen, but the dark limestone is not present and these are overlain directly by yellow shale. Along the cliff huge boulders appear in the cgl. some measuring up to five feet in one direction.

At the base of this section in the arroyo and at about 4409' comes the top of the Daine Ranch

The bioherms
are called 7260p.
The easternmost &
largest has *Scaphimella*.

(48)

member with great abundance of *Scacchinella* very beautifully displayed in section. On the east side of the arroyo is a low hill with many exposures of The Decie Ranch with *Heliopora* and other typical fossils. This exposure seems to be up dip from the beds on which we started our section. It also seems continuous to the the rest of the section. The fault at the Bioherm has only about 30' displacement but this may not be the main fault, just a sliver.

The knot at A30^r seems to be definitely *Larva* #2.

950

49

May 13

Ravine N from 702c.

726c - About 70' of Word ls # 2 which is mostly dolomite but contains innumerable fusulinids. In many places the rock is crowded with them. Other fossils are rare and scattered and at this place the rock is mostly dolomitized. Contains *Contipinnifera* and large *Eutectes*.

7602 - One block from upper part Word 2.

Neal Ranch shale in gully (M13)

Strike is E-W dip 8° N

0-8 hand level steps to fusuline bed (1' ls + fusulines a row at 10 Hb no more shale seen. 34 hand level steps from base of shale to base of cfl.

Later in afternoon collected at King 196. and got blocks at 706c for Sloan of Minnesota.

Discrepancy between my measurement of Neal Ranch shale on Horst with others is fact that my section is farther from the igneous body.

About 200' covered between top of shale & base of calc. masses
Total of about 275' shale

(50)

May 14 - Went to Alpine in morning because of fog.

Afternoon went to King's fossil bed 716 n and the next locality east of it 716 o
Section with fossils:

Hess lith

4-5' Fossiliferous light brown to with orange brown dirt - Snails

Cobbly limestone and some shale

33

2'

Hess lith

cgl, yellowish with smooth matrix & pebbles up to 2 or 3" all of smooth limestone

(716 o)

This section was made at locality east of 716 n. *Ischernyschewia* was found low in the section.

At 716 n *Ischernyschewia* occurs very low in the section all were found within 10' of the lower conglomerate.

Miranda roll 4- 27-28

952

(51)

May 15 Word Ranch

Pass section across 703b - 703a.

A 0-101 paces yellow shale with *Trochodonta* and *M. globosa* capped by 1' of poorly fossiliferous ls.

B 102-176 shale in thinner beds but interbedded with ls beds 4-6" thick

C 177-188 bioherm with *M. globosa*,

D 189-218 - yellow orange shale mostly occasional thin bed, large *Kochiprionotus*, *Rugosa*

E 219-305 - mostly gray biohermal ls. separated by thin beds of shale
At 349 comes *Leptodus* *Adamsi* =
May 703a'.

306-406 shale with scattered bioherms

Miranda 31, 32 roll 4 *Edriosteges* bioherms

+ 6' vertical in *Edriosteges* bioherms

The rock above this bioherm is clearly a different type than any of the shale. The shale is finer, slabbier, less orange and contains thin (1-3") slabs of bituminous limestone which are very flaggy.

Miranda roll 4 29 to end

Word 4 and Word one at Word Ranch

Miranda roll 5, 0-5 Word Ranch
and Words 2+3 at 706.

(52)

7264 - Leptodus ledge = 703a' extends along S side of road and produces a series of biohermal mounds throughout its extent. Lower of bed is in a shaly, cobbly rock like that typical of the bioherms. This is the first ledge below the uppermost bioherms just under the Road Canyon and is about 44 paces from a vertical distance of about 15'.

In Word #3 on crest of hill saw *Costispirifer* 26' below top, also *Entolites*. W#3 is about 60 feet thick. Word #2 about 45' thick. King p. 143 gives 40 + 50 respectively. Alpha roll 4 19-28 Old Word Ranch and flowers.

At Old Word Ranch the Road Canyon formation consists of two parts; a lower with thin shale bedded chert and bituminous limestone. In this part occurs loc. 703d, 703e. The upper part of the R.C. is dolomitic, massive biohermal limestone. Along the strike the lower bituminous limestone can be traced at least to 7260 where it is 50'.

(53)

Thick. West of 703c The lower bituminous beds become very thick individually and a large bioherm appears at the top.

A problem at this place is the proper disposition of the biohermal beds that form a ridge along the road - my 703a. These abound in Edriosteges and are very similar to 702c and the bioherms at the base of Road canyon in the hill north of Leonard Mtn. Yellow shales come right to the base of these bioherms as shown. They are new cuts that have appeared by erosion.

The first bioherms under the Edriosteges bioherms of basal Road canyon is characterized by *Leptodus* my old 703a'. These are probably the same level as those near the top at Split Tank.

955

(54)

May 16

Split Tank Area

Miranda roll 5 - 6 to 13 Split Tank

Alpa roll 4 - 29 to 30

Section at Split Tank

Line of section N50°W. Strike at base of cgl. N55°E 15°N.

A cgl. with *Onotatella*, small fossils & *Perrinites*. This thickens & thins along strike 26'

B Shale, yellow and yellowish gray thin-bedded 2-4" limestone with *Rugat*-e

C. Smooth massive biohermal ls. = 702 un - *Torgue*her., *Onotatella* 79' 68'

D Yellow orange shale with many sponges Shaly shaly ls at top for 35' horizontal 87'

E Smooth biohermal ls. = 702 ent 51'

F Mostly shale with isolated bioherm & thin-bedded ls. 51'

(55)

G Mostly massive bedded
calcareous, some chert
mostly detrital has occasional
bryozoa in it 34'

H. Mostly shale one small
bryozoa at base 39'

I Thin bedded coarse calcareous
detrital with clustitella 62'

J Shale with a few thin
calcareous beds 6" thick
End of clustitella
Many smooth Productus at
top, clustitella ends in
middle, Smooth productid
common at top 57'

K - Large bryozoa with
many small fossils, top of
M. globosa = 702a 111'

L - Shale in covered interval 39'

M - Shale with scattered
bryozoa containing large
Leptodids 58'

957

(56)

1042 feet
above base of
Cath. Mtn.

N - Mostly yellow shale with some thin blocky ls. beds with smooth productids at first 100' = 288'

726 wales with *Peniculauris*.

Above N comes smooth ls of Wood 1 with some scattered bioherms

The RC-CM contact is at 5450

just 100' below top of hill 5552.

726 w is in first 100' of N and

726 v is at about 200'.

Miranda 5, 6 chertella ind. at Split
Tanks. 7 = 702 ent

726y - shale above *Leptodus* bed with many smooth productids

726z - Lower bioherms of R.C.

Miranda Roll 5, 12, 13 pebble bed at base of Cathedral Mtn.

Shale N can be traced to east where it contains nearly to cobby beds 4" - 8" thick which contain smooth productids in abundance. Large *Peniculauris* is common. It is difficult to find a line of separation between Upper C.M. and Road Canyon where no bioherms are present. I took



Split Tank

300'

97036
Ford I
Aulostegia

shale

massive ls. with light

with small brach.

702a

definite

crinoid stems

Entelephas
some clams

702ent

yellow sh.

ls. with chert tubs
Uncinulites
Unfossil.

Pygmaea 702um
Sonicaster
Hesv

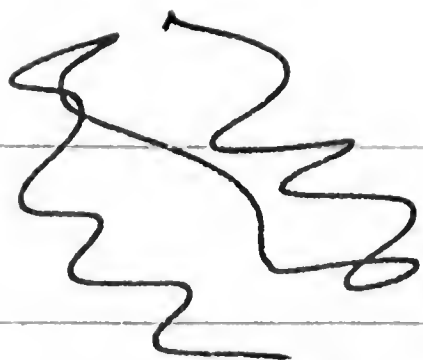
Split Tank section

N Shale	116'	16	
M " Scattered bioherms of Leptodermis		12	139 sh.
L " "		11	
K Bioherm 902a		30'	30
J Shale		14'	
i Coarse calcarenite		15	40 m. 173
h sh.		11	
g Massive calcarenite		10	
f Sh. }		12	
e Biohermalks }		12	
d Yellow shale }		24	
c 702 un bioherms }		19	
b Shale }		18	
a sgl.		8	

342

300 60

255
100

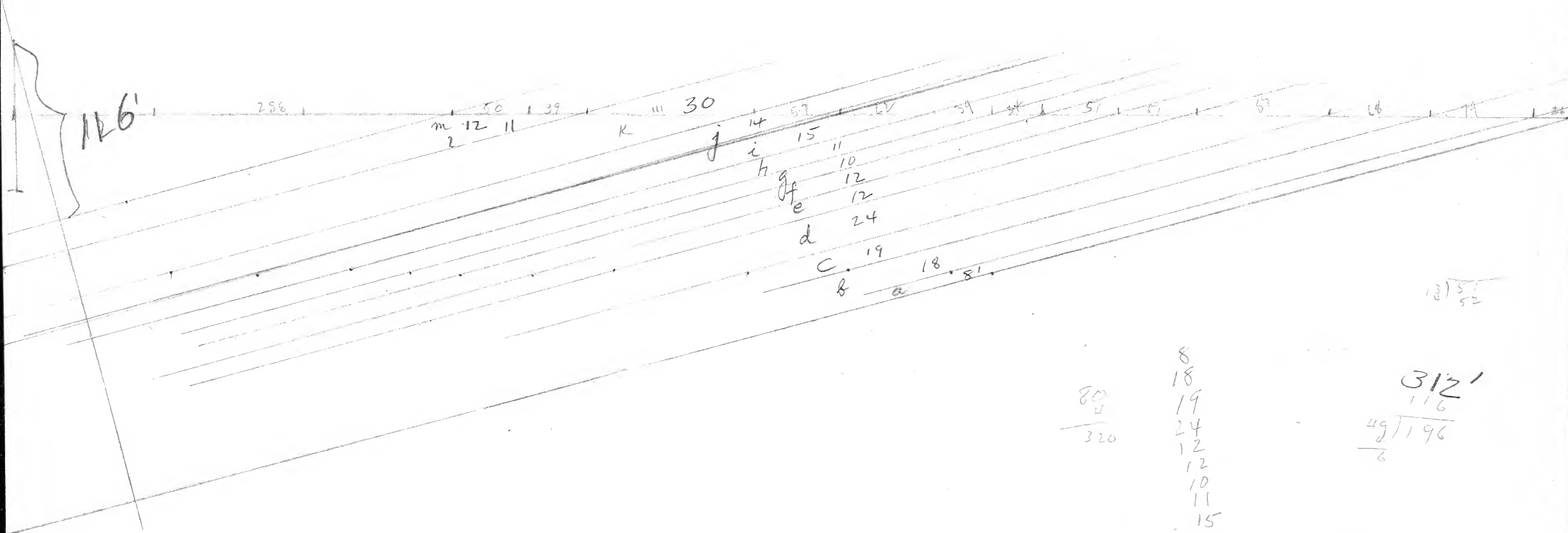


Vert 1mm = 4'
 Horiz. 1 1 4'

52

³⁰
~~312~~
 196

 116'



80

 320

8
 18
 19
 24
 12
 12
 10
 11
 15
 14
 30
 23
 116

 312

312'
 116

 49196
 6

(57)

The first appearance of the bituminous light gray smooth ls with dark fracture. Above this point thin beds of squashed fossils and scattered brachiopods are like those of the R.C.

7262 - This is also a difficult place to separate the two formations but the brachiopods that run near the bottom of the R.C. seem to have fossils of 702C type, such as lacy covered nictrofenid, Edinosteges, and the large nictrofenid.

1042

959

(58)

Miranda Roll 5, 14-16

Alpa Roll 4, 31-34

Catto - Gage Ranch

700-2 Leonard #5 - a veneer on
The north West end of Dugout Mtn.
Rock mostly thin bedded 4"-8"
beds of dark coarse calcarenite
or shell breccia with scattered
bryozoans, The latter containing
Ostitella + *Aulosteges triangularis*
The exact same fauna as we
see at 714 W in The Lenox Hills
in limestone #2.

May 17
Dugout
Mtn.

Ls #4 About 15-20' of heavy-
bedded (beds 8"-18" thick) of dark
fine-grained limestone, smooth
weathering with siliceous and
chert surfaces up to 4" thick.
Also includes some sandstone.
Occasional ammonite and
fragments of other fossils seen.
No distinctive fauna.

Miranda Roll 5, 14, 15 Leonard #4
" " 5, 16 " #3

(59)

700m - Limestone number 3
 N 83 E 14° N - 130 paces top to bottom

Section
 ls #3

Blocky dark limestone in beds from 4" to 1" thick, fine grained. Some layers with siliceous skins. Fossils rare: sponges and ammonites. The commonest

Section
 ls #2
 700n = lower part
 700n' = upper part

700n - Same type of ls as above. Also contains the same ammonites. 69 paces across outcrop N 43° E 13° N. Beds 4" - 1" often separated by thin layers of shale. Some thin beds of ss. Slightly conglomeratic at base, and a shell peccia at the top. Ammonites all thin = 700n

700p - Thick ledge of cgl. Contains same ammonites as ls #2 & #3 but has brachiopods, Glyptosteges?, Spiridiophora and Penicularis. This bed is not in sequence with ls# and is opposite a shale interval.

This appears to be #2
 700p - In stream bed 100 yds up stream from 700c is heavy bedded ss with cgl. lenses having pebbles large granitic, sponges & ammonites, possible Spiridiophora, Forynchites. Miranda roll 5, 17

(60)

700g Conical hill capped by about
 70 feet of lower Word, poorly
 fossiliferous but many fusulinids
 Lower part massive & somewhat
 biohermal but fossils uncommon
 Remainder of hill below in
 yellow shale, blue shale, some
 sand and a little cgl. of the
 Upper Leonard fossils very
 rare. *Edriosteges* was seen
 in the lowest of Word limestone
 beds, biohermal - also long
 crabs and some bryozoa.

962

(61)

May 18
Dugout Mtn.
South side

In saddle just E of peak. The
Dacie Ranch member pinches
out the WC. and makes the top of a
Knob.

700r small knob of about 30' of ls
or dolomite, rock much altered
= Leonard #3 of King. Under it
is about 15' of shale. This ls
has ammonites & brachiopods
like 700p of M17, and like 700m

Poplar Lake has very fine siliceous
yellow gray sh. Same type seen
with the #2. Yellow shale also
seen near base of Dacie R.

Hill 4811

7005 = Hill 4811 capped by
Leonard ls #3 of King.
Looks like same as 700r
on small knob. Consists of
about 15' of heavy-bedded ls
with siliceous shales and many
broken fossils. *Spiridionophora*
seen.

Between 7005 and 700t are
50' of chert, ss and yellow
shale.

4672

14814
139

(62)

Section in
hill 4811

4811

Ls #3

15'

4796

Sh &
chert

50'

4746

Ls #2

27'

4719

shale³⁸
chert

47'

5'

4672

Ls #1

Very
massive
biohermal

root along base of hill 4811
about 25 feet detrital ss,
yellow weathering, some sandy
and siliceous shins. This ls
appears much coarser than
above and is suggestive of 700p.
Fossils very badly broken up.
Saw many ammonites. Much infilled
sand. We collected ammonites
low in the member. Leonards
#2 and #3 seem to be almost
alike and have the fauna of
the upper part of the Sullivan
Peak member. I guess these
converge and unite with
the upper part of the Sullivan
Peak. The beds just above
the big bioherm at the south
end of Lewis Hill were
dark gray, bituminous
like those of Leonard #2
and #3 on Dugout Mtn.

Miranda roll 5, 18-23 Dugout Mtn.
Deer R., hill, cgl. at base, small conical hill.

Alpa roll 4, 35, 36 Dugout Mtn.
Alpa roll 5, 0-2 " " cholla

(63)

May 19
Dugout Mtn.

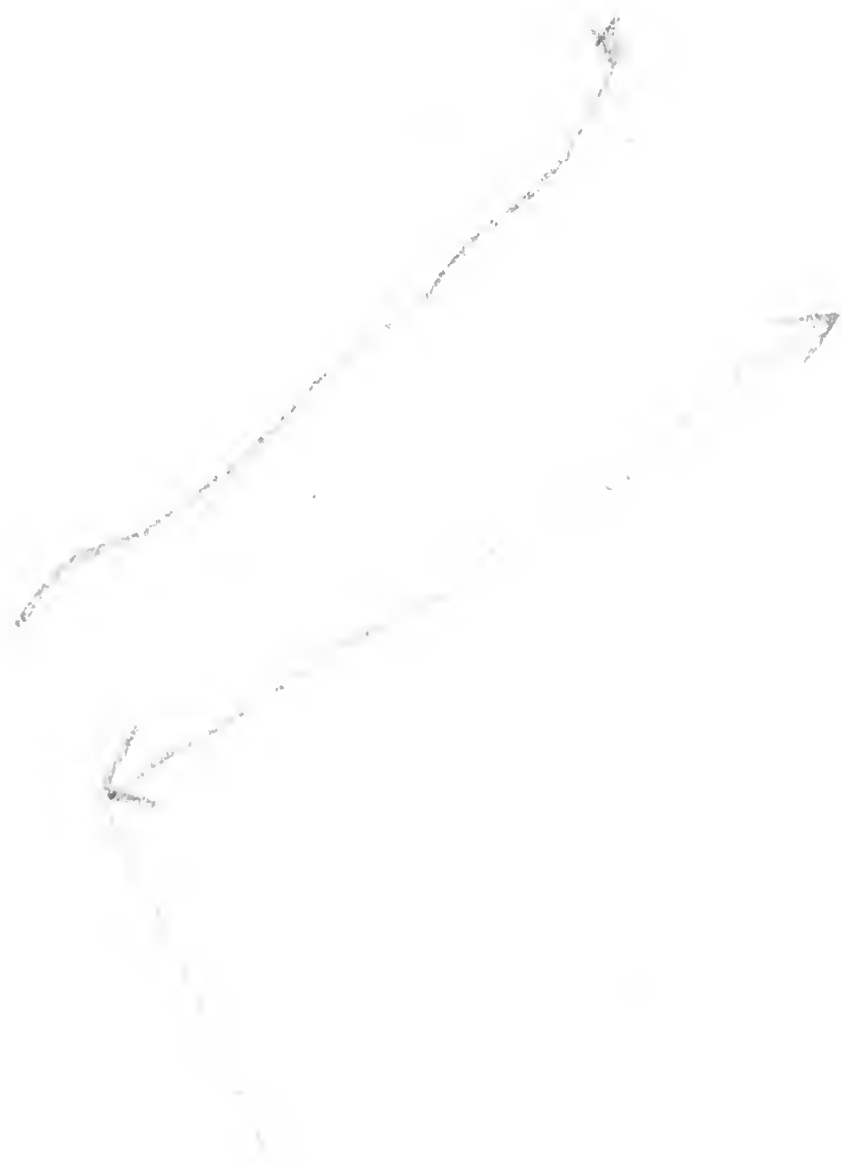
700u - Uppermost C. M. with
bright brownish yellow or orange
cobble, massive limestone with
a few scattered fossils

700w = M19 - Dark heavy bedded limestone
15'-20' thick abounding in
dark colored fusulines at top.
This is like bench at 700g.

700v - M19 is overlain by 10-15'
of sandstone forming small lumps
One thus occurs about 5-8' of
coarse detrital limestone, a
variable bed of fusulines of
larger size and weathered bedded.
That weather out on the slopes
This contains fossils suggestive
of 702c. I suspect the Road
Canyon frogs out to the west
from Cathedral Mtn.

700x - Onitella beds of Leonard
#5. Mostly calcareous but with
small brachiopods

700y - Lower part of Leonard #1
with Poplar Tank sh & thin ls
on slope. Coll 2 pieces, the yellow
one is Poplar Tank



(64)

7002 - Fusulinids about 50' above gully in the Poplar Fork which consists of fissile shale, limestone beds up to 1' or more thick, mostly calcarenites, thin cgl. and beds of pinkish chert. Rare.

The hill is capped by Sullivan Peak which consists of very heavy-bedded massive ls. band with thin brown siliceous skins, others with thicker pinkish chert. The latter also occurs in layers of 1' thick cgl. in form of ls. cgl. with pebbles near bottom, conoidal cgl. near top. A few shell breccias occur.

727a is a shell breccia about 10' below top. Fusulinids also taken here. About 75' of Leonard #1 on the edge of this hill. From this place it looks as though Leonard #2 may join Leonard #1 on the north knob of the Mtn.

An occasional bit of *bidens* occurs midway in the Poplar Fork.

Miranda Roll 5, 26, 27

Dugout Mtn, Sandstone hill (2), Leon. #5

Alpa Roll 5, 3-8 Dugout Mtn. and small cacti at 700x.

200
201
202

$$\begin{array}{r}
 22 \\
 22 \\
 \hline
 44
 \end{array}$$

271

(65)

Walked east from gully at 727a across outcrop of D. Fier Ranch. Consists of very heavy bedded calcarenite and cgl. containing pebbles up to about 3-4" partly rounded and ragged chert 727b - found *Spirifer* in thin ls on surface of D.R. These thin ls are probably Poplar Tanks.

Top Deric Ranch in bank opposite 727b. Has a full section of Poplar Tanks is present. A complete section of the Poplar Tanks is present from 727b up to 727a and about 75' of Leonard #1. The Poplar Tanks is well displayed on these and surrounding slopes.

May 20

Wolfcamp Hills

WC4 is feet thick mostly limestone cgl. few fossils, well scattered. *Strophomena* common.

Leptodonta reef definitely at top of bed 2, contains little *Leptodonta*, *Limbella* and, to me, is definitely *Leptodonta*. Definitely an algal reef as it has much *Leptodonta* material in it. It is about 10' in diameter, is surrounded and flanked by calcarenite. Top stands 2' above top of *Leptodonta* rock. It is slightly to the side where it had contact with shale.

Relocate *Leptodonta* bed

Collected in Udden's zone from saddle to east end hills. *Amphitrodes* but for *Leptodonta*. Peculiar algae abundant.

Pieces marked

Lept.

(66)

967

Miranda roll 5, 28-30 WC hills

Alpa roll 5, 9-15 WC hills

May 21.

Wolfcamp Hills, West side

Paul 4 - N 62° E 69 N near 727e

At Uddenites saddle a great amount of gullying has taken place since the last visit. Collecting not good. At the saddle, N side the bed #2 is 8-10' thick and about 5' of shale intervenes between it and the light yellow beds of the Uddenites zone.

Bed two runs to the west and contains a great amount of limestone cobbles, in fact it is mostly corall. limestone.

727e - This is bed four and the locality is about that of 701-b. Bed 4 can be walked to Uddenites saddle with one small offset to the north on N side of saddle. Here it almost lies on bed 2. Bed 4 is about 3/4 cobbly & corall. and the rest calcarenite.

Alpa Roll 5, 16-20

Wolf Camp hills, Uddenites saddle

Miranda roll 5, 30-end

Wolf Camp Hills, Uddenites saddle

Afternoon collected 2 blocks at 721g

968

(67)

May 22

Small Hill NW of Hess R.
N. 35° E 21° N

Vertical
Dist

D - Just under the chert on SE side hill comes thin lens, lenses with occasional ammonites & many broken fossils. Spiridifera seen in all parts of hill.

C - Some layers with chert skins. containing the fossils. Contains some low bioherms with spines especially at W end. Hill for C. layers are thin & replaced by chert of D. In east end of hill no chert.

11

D. Pinkish chert in layers up to 6" - broken into lumps. Some thin beds of ls. at top.

12'

C. Various, bedded but mostly thin bedded below. Contains Cryptostegia, Spiridifera

7'

B. Heavy bedded, mostly calcarenite

26'

A. Hard biohermal massive rock with fossils. Rock biohermal but not dolomite.

727 f
probably from A.

I suspect that the ... beds ... to E West end of section ... some calcarenite ... but they are not ...

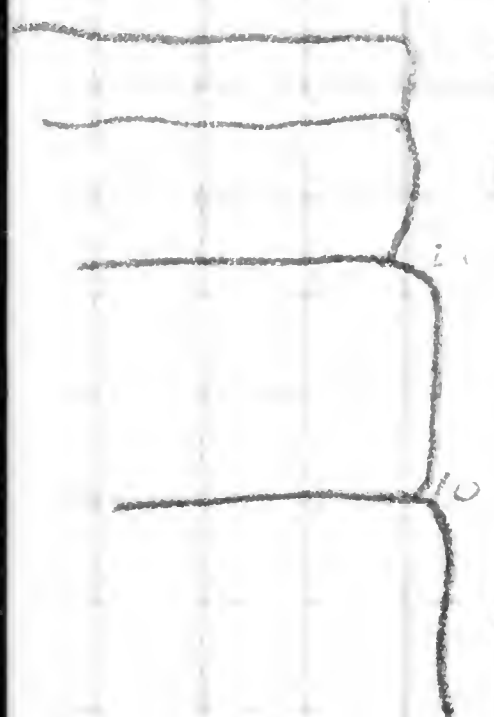
Lower part C = 727m
Linsy equivalent of D = 727m =
goniatite beds

This knob belongs entirely in the upper part of the Sullivan Peak member

(8)

727g-

Across Hill 5305
Hess R. Herat



calcareine massive
Biohermal beds

massive calcarenite

Bioherms with Scaphinella

Fusulinid just 4-5' below crest of hill at about 5157 on south slope of narrow-lobe. Flung 10' over Biohermal beds with Scaphinella and below other Biohermal beds. Location of this place 727g is just west of the high part of hill where it narrows toward the west. Lower beds here toward the ravine perhaps 30-50' above it abound in large Omphalotrochus.

727h - from half way down slope

727i - High Wolfcamp. Dip slope directly from crest off 5305 down to first notch is in lowest part of Scaphinella beds.

727k - about 1/3 down from saddle on N of Hess Ranch. Fusulinid.

(69)

May 23
Wolfcamp on foot + Lenox Hills
Hill 5250

at 17°

A - To cgl. boulders up to 2' in one direction
matrix of ls with chert pebbles N45°E 17°
B - Thin bedded sandy ls. with some lime
cemented base. One small cgl. cl. f.

Top of cgl.
3 sight

F - dark brown, chert pebbles in matrix

15 sight

E 75° mostly spherical chert pebbles in yellow brown

2 sight

D 10 covered

Total cgl. = 310'

35 sight

C 175' small chert pebble cgl. mostly dark
brown sand. occasional
larger ls. boulders in base

3 sight

B 15'

3 sight

A 15'

15
75
10
175
15
15
305'

Beds of
algae

A' 15' but mostly covered, chert pebbles
matrix of ls. + chert pebbles algae on

Shale measure

13 sight

Shale with thin beds of ss + limy ss.

3 sight

F - shale cgl. ls. + ss

3 sight

Shale capped by thin bedded hard ss.

6 sight

C - shale + thin bedded cgl. sandstone 12"

11 sight

B - 1/2 fossiliferous ls. with graptolites

9 sight

A - Shale

cgl.

65
15
15
30
45
2
172'

172'

Long

8

59

5150
119
5138

13

215
115
100

(70)

Section in Decie Ranch at 5300' in cut just east of best exposed section of Poplar Tank

0-32' massive unbedded conglomerate with limestone boulders of large size up to a foot in diameter and rounded limestone pebbles. At 15' there is a bed of small pebbles about 1/2 inch in diameter and about 1/4 inch thick.

The 32' is capped by 5' of sandstone and 15' of shale. Below this is yellowish shale.

Hall 5250

gray ls	32'
cgl.	15'
sh	70'
ls	15'

Hall 5300

Went up gully just west of 7270. The hill is a sandstone. Top of hill is 40' of small pebbles of the 32' floor well rounded. Part of a quartz.

Leonard 2 is 2-3' thick where we went up hill. Mostly dark calcarenite with some pebbles and a boulder from which Aphelasma was taken. = 7270

Bounded by saddle from 6 feet at the gully just on the east side of hill 5250. To about 15-20' just below the crest of the hill which is capped by L#3. Between L2 and L3 is 70' vertical to bottom of 3. Base of 3 is massive small pebble cgl. of about 15' thickness. This is capped by gray weathering L#32. Ammonites occur in cgl as well as the fine grained calcarenite.

7270 dip slope of hill 5250 where dip is underground. Trichonema pieces with Chonetella

7270 - Ammonites from saddle

Top of L#2 is at 5733' el.
= 7270'

5300
103
5197

(71)

Bed 3 forms surface of divide between knobs over to base of 5300.

From bed 3 to base of limestone on hill 5300 is 87'; then 5' are covered and the remainder which is 8' is in hard massive fossiliferous ls. Top of 3 would be at 5197 just below Hill 5300.

7275 - Top of 5300 - rocks are a ledge - pedge of types and I make nothing definite recognizable out of it. The rocks are difficult to get. Some rock is laminated with siliceous fossils mostly corals and some sponges.

The shale between 243 and 34. hill 5300 is very fine and platy.

#3 passes laterally from hill 5230 into dark chert. The cgl ls. appearing just east of hill 5300. The section appears like that underneath hill 5250. Under hill 5300 it is mostly chert in beds 6" thick and dark ls in beds 6" to 1' thick.

130' of coal between Leonard #1 & #2 in hill 5300.

L. #1

107'

40'
6'
20'
5'
4'
5'
25'

small pebble cgl.

ss

Massive cgl. ls. with fossils

ls

Pink chert

Massive ls. looking to corals, siliceous chert with layers pink

chert

massive ls. with siliceous chert

(72)

King does not map limestones on top of hill 5300 as Leonard #4.

Miranda roll 6, 0-5

Alpa roll 5, 21-31

May 24

Section up Dixie Run on hill with thick shale. This section is at about the middle of the hill

Fusulinids abundant at top = 727t

12'

H Gray massive calcarenite with a small bed of siltstone at top

5'

G cobbly-muddy ls. with fossils & pebbles

2'

F fine shale, yellow

4'

E massive calcarenite with a few scattered small pebbles

7'

D yellow platygastri with 6" ditto (ls. 1 1/2' below top)

18'

C pebble cgl, pebbles small, dirt becoming calcarenite at top.

8'

B calcarenite with siliceous skins with bed of siltstone fine grained ls. 2' below top

32'

A cgl. quite variable. Hard, no bedding, contains boulders up to 4' of foot with scattered small rounded or egg chert & quartz pebbles

98'

Levy Hills shale

At west end of hill much broken ls. with fossils, some flat beds and thick lenses of cgl. like that below - Perhaps W.B. Glen beds character near fault

(73)

727 u - 2 loose blocks from Decie Ranch.
E has a 2' siliceous skin

On east side hill considerable yellow
stone at base. Also large yellow stone
appears to beginning of Poplar Tank
Perhaps upper 20' of Poplar Tank
Dark measuring in shales on east
side 138'; On west side 124'.

172x Leonard #3 has 5 1/2' of small
pebble (1/4 - 1/2") agl. at base. Rest mostly
dark detrital with goniatites at a
given about 15'. Upper part heavy bedded
fine grained calcarenite, beds up to 1' thick.

About 35' of slope between 3 & 4
in cherty rock. The top into small
yellow lumps.

727v - Ammonites from base of Leonard #4

Leonard 4 - Lower 10' in Buck -
bedded dark calcarenite at boundary
in ammonites in patches. About 35'
of slope covered by this rock 727v for
ammonites.

727w - patches with brachiopods
Aphelasma, Leptædia, and others.
Specimens do not break out well
and the material is fragmentary
This is at the top of Leonard #4/.

727x - bioherm of smooth green or blue
gray ls, about 6' high by about 15'
wide surrounded by sandstone
contains a nautilus and other
associated fossils. Bioherm looks
like Split Tank ones approximately
Kings locality 30-31.

975

(74)

Miranda roll 6, 6-16 - Hill
with large shale exposure SW end Lenoir
hills - view of Windmill hill
Alpha roll 5, 32 - end - hill
with large shale exposure
SW end Lenoir Hills

May 25 - Montgomery Ranch
Here - First fusulines at about
4880 = 7274; fusulines at 4920 = 7272.
Fusulines (H) top of hill 4950 = 7290

First fusulines seen at 4880' on
slope, 40 feet above comes another
fusuline band with large *Amphileta* etc.
Large *Amphileta* etc. at crest of hill

729C - Fossil bed consists of

6-8'	crinoidal ls with a few fossils
15-18'	Silty ls. with ^{yellow} brown, irregular small chert masses - occasional fossils
5-6'	ls cgl. small to large pebbles

729d - Algae coated fusulines near
top of hill.

729e - loose piece just under
first fossilized ledge at 7274.

(75)

May 26

Packed blocks all day

May 27

Packed blocks all day

May 28

Finished packing, hauled blocks to RR. Went to Maya.

May 29.

Cibola Creek $N44^{\circ}E32^{\circ}S$ Section opposite Tributary (1st)
Compass at 32° .

0-11 Steps - mostly covered - probably shale and yellow thin-bedded limestone

0-11 - Cobbles up to a foot or more, The cobbly zone of the boulder.

0-3 hard bryozoa ls. massive
In step (0-11 cobbles) a large bryozoa appears on side of ravine. In this we took *Stenocrinus* and *Leptodict* blocks. It is probably 30 feet below top of W.C.Section on E bank
of Arroyo.

0-14 covered shale - cobbly interval

0-4 massive bryozoa ls.

0-9 covered probably shale

0-8 cobbles

0-6 massive bryozoa - identified fossils

0-11 cobbly zone mostly covered

(76)

0-5 massive lime stone, broken
capped by 1 shell breccia with
fusulines - 728m

Above this the beds are platy
and thin with much chert.

Big fusulines from side of
bioherm where stream cuts closest to
ridge. The fusulines are out of the
lower bioherm with much yellow
in it. The higher bioherm produced
large Scacchiella.

Collections

Fusulines from above bioherm 728m

Scacchiella from uppermost bioherms 728-j

" " " " " 728K

Leptodids from lower bioherm 728-L

Fusulines top of bioherm 728m

Went from ranch house to Alta Creek
to Permian outcrops along the creek. At
the junction of the Alta and Cibola
creeks is an igneous body that has
baked the limestone and obliterated
the fossils. A little farther on large
massive beds of limestone appear
which are quite massive. These overlie
yellow shale and limestone perhaps
30' (vertical) above them. The massive
limestones are bioherms which occur
in 2 tiers, a lower and an upper one.
We found Scacchiella in both sets.
A possible intermediate one also
occurs. In the lower one occurs
large Leptodids which are fairly
conical in form. We also found a
multiplicate Stenocrania in
both beds with a large Wellerella.
What look like typical
fusulines were taken from

(77)

The mealy zone under the lower bioherm which lies under the first conspicuous bioherm that extends high on the hill. This is opposite the point where Alta Creek cuts closest to the Permian outcrop belt. See picture Miranda Roll 6. ²⁵Alpa Roll 6, picture 11. This is the highest bioherm which juts way up into the air and is the first prominence just west of the igneous body Tig about $1\frac{1}{4}$ miles NE of the junction of the two creeks.

The biohermal beds are capped by cherty and thin-bedded limestone and pinkish chert. The latter suggests the Shimmer Ranch chert.

These bioherms are in the brecciated zone of Udden which has been dated as Upper W.C. on the basis of fusulines. Were it not for these I would call the brecciated zone the same as the Decie Ranch fm. Actually the fauna of the bioherms suggests Sefton's Lower Bone Spring which is surely Decie Ranch in age. It is just possible that the "brecciated" beds, sponge beds and next higher limestones belong to the Shimmer Ranch. Shimmer says most of Cibola limestone is high W.C.

Alpa - Lower pictures of Abolonegum on roll 6

(78)

May 30

Left Mayfa for Van Horn which we reached at 11 A.M. After lunch collected at M30 locality = Turtleback, locally called 3-Mile Mtn.

May 31

728e

Went to Victoria Canyon and collected blocks all day. Climbed to top of knob. The massive Bone Spring goes to about 125' of the top of the knob to about 4625' where the thin bedded material abruptly appears. The entire sequence of thick-bedded Bone Spring contains fossils like those taken just above the Huaco. *Quadrachonetes* and *Rhipidomella*, *Altiplanus* were seen at and near the top. Collected foraminifids at 4625' = 728e.

Punctured radiator getting out of sand in Victoria Canyon.

Alpa role 6 - Views of Sand Sierra Diablo, casti and Victoria peaks

Three-Mile Mountain is definitely the correct name for the easternmost knob about 3 miles NW of Van Horn. It is often called Turtleback. According to the owner both names are applied to this hill. Labels must be checked & corrected at home.

June 1

Spent day waiting for car to be repaired.

(79)

June 2

Started out for localities 73/ and Newells 635. Unable to reach them because of washout in a heavy rain on Saturday. Went to 728 p which is ~~Lamiae~~ in the bluff just S of entrance to D Ranch headquarters. The fossil bed is in the lower part of the bluff at the top of heavy bedded ls and just under the thin-bedded layers. Called on Mrs. Glover.

June 3

Went to Seven Heart Gap. Take road to east about $\frac{1}{2}$ mile N of R.R. station in Van Horn, farm road 1295. Entrance to Gap is lined by massive unbedded limestone varying in thickness from 10 to 30 feet. This limestone is biohermal in places and contains some algae. The bioherms are mainly broken and consist chiefly of *Neophlebotomya* and *Murchisonia*. There are also *Hastellia*, *Pentamerus*, *Amplexus*, *Stenocrinus*. The assemblage is clearly Capitanian.

Above the massive bed comes about 50 feet of thin-bedded bituminous limestone with strong petroleum odor when broken. This contains small rhynchonellids but few other fossils. Layers of limestone appear and small bioherms but fossils are generally rare. Collection 728 q taken on south side Gap at entrance from just below massive bed. Coll 728 r

(80)

is from the bituminous upper beds.

Below the massive comes thin-bedded platy ls with some chert.

This limestone is not so dark and bituminous and is flatter bedded than the upper dark ls.

We looked at this limestone in 2 places west of the Gap. at 7285 about 150' of this is overlain by the massive and the latter by the upper bituminous limestone. The lower limestone also contains scattered lenses and bioherms usually with abundant and detached valves of *Neophracodonta* & *Martinitia*.

The upper limestone is overlain by gypsum of the Ochans. Met a Philip W. Bechley, manager of bank working in the gap who says all of that limestone is Lower! This works in well with the former

June 4

(81)

Packed blocks and boxes all morning. Sent 2 boxes parcel post and 17 bundles + 1 box of common stone at 2603 lbs., 1 water can at 29 pounds and 3 bundles of tools at 62 pounds. Tools = 3 bars, 2 sledge hammers and one shovel.

Work out relationship of Scacchinella
to Schizogonia crassitectoria - Is
it reworked in the Poplar Lake.
Is the Davis Ranch Scacchinella
a lower zone than the
Scacchinella with S. crassitectoria
This must be harmonized

984

Register of blocks

31

12

★	723K	- - - -	1		
★	723-7	- - - -	3	& 3 small	★ 726X - - - - 1
★	723o	- - - -	1		722-7 - - - - 1x
★	723t	- - - -	7		★ 727a - - - - 1x
★	723u	- - - -	2		★ 727d - - - - 2
★	720d	- - - -	2	1 small	706e - - - - 3
★	723X	- - - -	1		721g - - - - 2
★	723v	- - - -	5		★ 727e - - - - 5
★	723w	- - - -	7	small	719z - - - - 1v
★	724a	- - - -	3	1 small	721t - - - - 1x
★	724b	- - - -	4		★ 727j - - - - 3
★	723z	- - - -	1	small	707a - - - - 1xv
★	724c	- - - -	4		★ 727p - - - - 1
★	721z	- - - -	1		728e - - - - 7
★	724d	- - - -	1		★ 728-7 - - - - 3
★	724j	- - - -	2		★ 728p - - - - 5
★	724u	- - - -	3		★ 728g - - - - 1
★	726d	- - - -	5		
★	726f	- - - -	4		
★	719x	- - - -	4	✓	
★	720e	- - - -	6		
★	724p	- - - -	4		19,200
★	726e	- - - -	1		
★	724a	- - - -	1		
★	724t	- - - -	7		
★	726o	- - - -	5		
★	726n	- - - -	5		
★	726t	- - - -	3		
★	726u	- - - -	2		
★	703a	- - - -	1		
★	726z	- - - -	5		
			101		

Total 140 blocks

726n - 1 check

$$\begin{array}{r} 16600 \\ 2600 \\ \hline 137 \overline{) 19300} \\ \underline{13700} \\ 5600 \\ \underline{5340} \\ 2600 \\ \underline{2600} \\ 0000 \end{array}$$

10